



NASA SP-7041 (05)

# EARTH RESOURCES

A CONTINUING BIBLIOGRAPHY WITH INDEXES

ISSUE 5

OCTOBER 1975

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

## PREVIOUS EARTH RESOURCE BIBLIOGRAPHIES

Remote Sensing of Earth Resources	(NASA SP-7036(01))
Earth Resources	(NASA SP-7041(01))
Earth Resources	(NASA SP-7041(02))
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Earth Resources	(NASA SP-7041(04))

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# EARTH RESOURCES

**A Continuing Bibliography  
With Indexes  
Issue 5**

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced between January 1975 and March 1975 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA)*



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OCTOBER 1975  
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# INTRODUCTION

The technical literature described in this continuing bibliography may be helpful to researchers in numerous disciplines such as agriculture and forestry, geography and cartography, geology and mining, oceanography and fishing, environmental control, and many others. Until recently it was impossible for anyone to examine more than a minute fraction of the earth's surface continuously. Now vast areas can be observed synoptically, and changes noted in both the earth's lands and waters, by sensing instrumentation on orbiting spacecraft or on aircraft.

This literature survey lists 601 reports, articles, and other documents announced between January and March 1975 in *Scientific and Technical Aerospace Reports (STAR)*, and *International Aerospace Abstracts (IAA)*.

The coverage includes documents related to the identification and evaluation by means of sensors in spacecraft and aircraft of vegetation, minerals, and other natural resources, and the techniques and potentialities of surveying and keeping up-to-date inventories of such riches. It encompasses studies of such natural phenomena as earthquakes, volcanoes, ocean currents, and magnetic fields; and such cultural phenomena as cities, transportation networks, and irrigation systems. Descriptions of the components and use of remote sensing and geophysical instrumentation, their subsystems, observational procedures, signature and analyses and interpretive techniques for gathering data are also included. All reports generated under NASA's Earth Resources Survey Program for the time period covered in this bibliography will also be included. The bibliography does not contain citations to documents dealing mainly with satellites or satellite equipment used in navigation or communication systems, nor with instrumentation not used aboard aerospace vehicles.

The selected items are grouped in nine categories. These are listed in the Table of Contents with notes regarding the scope of each category. These categories were especially chosen for this publication, and differ from those found in *STAR* and *IAA*.

Each entry consists of a standard bibliographic citation accompanied by an abstract. The citations and abstracts are reproduced exactly as they appeared originally in *STAR*, or *IAA*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the variation in citation appearance.

Under each of the nine categories, the entries are presented in one of two groups that appear in the following order:

- IAA* entries identified by accession number series A75-10,000 in ascending accession number order.

- STAR* entries identified by accession number series N75-10,000 in ascending accession number order;

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- subject, personal author, corporate source, contract number and report/accession number.

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## TYPICAL CITATION AND ABSTRACT FROM STAR

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NASA ACCESSION NUMBER → N75-12419\*# Lockheed Electronics Co., Houston, Tex. ← CORPORATE SOURCE

TITLE → FEASIBILITY STUDY ASCS REMOTE SENSING/ COMPLIANCE DETERMINATION SYSTEM Final Report I. E. Duggan, T. C. Minter, Jr., B. H. Moore, and C. T. Nosworthy Jan. 1973 137 p refs PUBLICATION DATE

CONTRACT OR GRANT → (Contract NAS9-12200) (NASA-CR-134288; EO-126) Avail: NTIS HC \$5.75 CSCL 05B AVAILABILITY SOURCE

REPORT NUMBER → A short-term technical study was performed by the MSC Earth Observations Division to determine the feasibility of the proposed Agricultural Stabilization and Conservation Service Automatic Remote Sensing/Compliance Determination System. For the study, the term automatic was interpreted as applying to an automated remote-sensing system that includes data acquisition, processing, and management. Author

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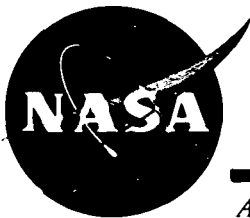
AIAA ACCESSION NUMBER → A75-10644\*# TITLE

AUTHORS → K. Hanson (Miami, University, Coral Gables, Fla.). Journal of Physical Oceanography, vol. 4, Oct. 1974, p. 594-600. 8 refs. AUTHORS' AFFILIATION

CONTRACT OR GRANT → Contract No. NOAA-04-30-2212. NASA Order S-70246-AG-1. TITLE OF PERIODICAL

Photographic data received from the ERTS-1 satellite over the Lesser Antilles Islands show distinct ocean features on the leeward side of each island. Attempts to relate these features to ocean eddy formations with the aid of ground truth data proved unsuccessful. However, surface and upper air wind data indicate a good correlation with the size, shape, and downwind extent of the ocean features. Studies to date indicate strongly that these features result from horizontal differences in a sea surface roughness due to the wind-shadow effect of the islands. The results suggest that horizontal variations in the reflectance of the sea surface will make remote sensing of the ocean mixed layer more difficult than previously anticipated. The surface reflection seems to be large enough to mask the smaller variations in backscattered energy from the mixed layer. Efforts to limit the effect of surface reflectance by photographic differencing of two multi-spectral scanner bands were unsuccessful. (Author)

PUBLICATION DATE



# EARTH RESOURCES

*A Continuing Bibliography (Issue 5)*

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## AGRICULTURE AND FORESTRY

Includes crop forecasts, crop signature analysis, soil identification, disease detection, harvest estimates, range resources, timber inventory, forest fire detection, and wildlife migration patterns.

**A75-12033 #** A comparison of Skylab and ERTS data for agricultural crop and natural vegetation interpretation. R. I. Welch, L. R. Pettinger, and C. E. Poulton (Earth Satellite Corp., Berkeley, Calif.). *American Institute of Aeronautics and Astronautics and American Geophysical Union, Conference on Scientific Experiments of Skylab, Huntsville, Ala., Oct. 30-Nov. 1, 1974, AIAA Paper 74-1219*. 12 p.

Images from the Skylab Earth Resources Experimental Package (EREP) system are compared with those obtained from the multispectral scanner on the Earth Resources Technology Satellite (ERTS). The study is aimed at a comparative assessment of the usefulness of the EREP and ERTS remote sensing systems for identification and evaluation of vegetation resources by testing the ability of photo interpreters to make the desired interpretations on selected types of EREP and ERTS imagery. M.V.E.

**A75-12872 \*** Agricultural inventory techniques with orbital and high-altitude imagery. C. M. Hay (California, University, Berkeley, Calif.). (*American Congress of Surveying and Mapping and American Society of Photogrammetry, National Fall Technical Convention, Columbus, Ohio, Oct. 11-14, 1972*.) *Photogrammetric Engineering*, vol. 40, Nov. 1974, p. 1283-1293. NASA Order R-03-038-002.

An investigation was conducted regarding the feasibility of an employment of satellite imagery for land-use stratifications, taking into account present operational systems. It was found that satellite imagery of the quality of ERTS-1 can offer a feasible solution to the problem of out-of-date stratification. Other studies reported are concerned with the level of accuracy obtainable in a crop inventory for a specific crop using high-altitude aircraft photographs. G.R.

**A75-15180 #** Microwave emission characteristics of moist soils (Kharakteristiki izlucheniia vlaznykh gruntov v SVCh diapazone). A. E. Popov, E. A. Sharkov, and V. S. Etkin (Akademiia Nauk SSSR, Institut Kosmicheskikh Issledovani, Moscow, USSR). *Meteorologiya i Gidrologiya*, Oct. 1974, p. 49-57. 9 refs. In Russian.

The emissivity and polarization coefficient of moist-soil is calculated in the wavelength range from 0.8 to 226 cm for moisture up to 30 %. The calculations are based on experimental relationships

between the electrical parameters of the soil (attenuation factor and permittivity) and the moisture content. The effect of firmament illumination on the radio brightness temperature and the polarization coefficient of moist-soil emission is considered. It is shown that the optimal wavelength range for passive remote probing of moist soil is 20-75 cm, depending on the desired probing depth. A.T.S.

**A75-16241** Vegetation canopy reflectance. J. E. Colwell (Michigan, Environmental Research Institute, Ann Arbor, Mich.). *Remote Sensing of Environment*, vol. 3, no. 3, 1974, p. 175-183. 13 refs.

Possible cause-effect relationships in producing vegetation canopy reflectance are discussed. Hemispherical reflectance and even bidirectional reflectance measurements are shown to be inadequate to predict or understand vegetation canopy reflectance in many situations. Among the additional important parameters necessary for prediction and understanding of vegetation canopy reflectance are leaf hemispherical transmittance, leaf area and orientation, characteristics of other components of the vegetation canopy (stalks, trunks, limbs), soil reflectance, solar zenith angle, look angle, and azimuth angle. The effects of these parameters on vegetation canopy bidirectional spectral reflectance are described. (Author)

**A75-16242 \*** Active microwave measurement of soil water content. F. T. Ulaby, J. Cihlar, and R. K. Moore (University of Kansas Center for Research, Inc., Lawrence, Kan.). *Remote Sensing of Environment*, vol. 3, no. 3, 1974, p. 185-203. 22 refs. Contract No. NAS9-10261.

Measurements of radar backscatter from bare soil at 4.7, 5.9, and 7.1 GHz for incident angles of 0-70 deg have been analyzed to determine sensitivity to soil moisture. Because the effective depth of penetration of the radar signal is only about one skin depth, the observed signals were correlated with the moisture in a skin depth as characterized by the attenuation coefficient (reciprocal of skin depth). Since the attenuation coefficient is a monotonically increasing function of moisture density, it may also be used as a measure of moisture content over the distance involved, which varies with frequency and moisture content. The measurements show an approximately linear increase in scattering with attenuation coefficient of the soil at angles within 10 deg of vertical and all frequencies. At 4.7 GHz this increase continues relatively large out to 70 deg incidence, but by 7.1 GHz the sensitivity is much less even at 20 deg and practically gone at 50 deg. (Author)

**A75-16682** Terrain measurement from holographic stereograms. J. T. McCrickard (Northrop Corp., Hawthorne, Calif.). In: *Coherent optics in mapping: Proceedings of the Tutorial Seminar and Technology Utilization Program, Rochester, N.Y., March 27-29, 1974*. Palos Verdes Estates, Calif., Society of Photo-optical Instrumentation Engineers, 1974, p. 191-198. Grant No. DAAK02-73-C-0037.

## 01 AGRICULTURE AND FORESTRY

A study to determine the feasibility of measuring terrain from aerial stereo-photos displayed in the form of holographic stereograms. To compare left and right photos of a stereo-pair, a property of holograms is used, which is that two or more focused images can be superimposed on the same film, yet separately viewed under properly directed illumination. By laying one picture on the other, the distance is minimized between the two images of a feature, thereby reducing errors when simple measurement apparatus is used. A stereo-pair of a coordinate grid is also overlapped onto the stereogram so that all data can be differentially measured. For best results a set of grid points which are referred to points of known geographical coordinates is used. F.R.L.

**A75-17104 #** An examination of the extent of fire in the grassland and savanna of Africa along the southern side of the Sahara. W. Deshler (Maryland, University, College Park, Md.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 23-30.

**A75-17106 #** A method of specifying remotely sensed units for soil sample points. G. A. May, G. W. Petersen, F. Y. Borden, and D. N. Applegate (Pennsylvania State University, University Park, Pa.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 83-89. 6 refs.

Three sites were selected from Berks (shale-derived), Duffield (limestone-derived), and Penn (siltstone-derived) soils. A uniform training area was selected within each of these sites. The multi-spectral scanner data within each training area were analyzed by computer programs. Soil samples were collected within each training area. The angle and distance of each sampling point from the constructed base line was determined by a stadia rod. The angles and distances were input to a remotely sensed unit (RSU) identification program that outputs the scan line and element number (RSU) of each sampling point. Results from this program indicated that a high percentage of soil sampling locations were within previously designated training areas and that the duplication of soil samples within an RSU occurred at only one site. (Author)

**A75-17113 #** A clustering algorithm for unsupervised crop classification. L. Borriello (CSATA, Bari, Italy) and F. Capozza (Telespazio S.p.A., Rome, Italy). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 181-188. 5 refs.

In heuristic clustering algorithms, the initial value selected for cluster centers and thresholds has often a significant impact on the result which is going to be obtained, i.e., on the final position of the clusters and their number. Therefore, the initial values for the cluster centers must be known to a fairly good extent to ensure successful convergence of the algorithm to the true cluster centers. Adequate thresholds must further be selected in order to prevent scattered observations from affecting the convergence process. The algorithm described in this paper automatically determines the initial value for cluster centers and thresholds, by analyzing the histograms of the observations to be clustered. Thus, in this procedure the initial centers are close to the final ones and convergence is obtained in only a fraction of the iterations required by conventional heuristic clustering procedures. A table look-up procedure yields a further reduction in the computer time required to run this algorithm. (Author)

**A75-17122 \* #** Areal extent of snow in forested regions - A practical estimation technique using ERTS-1 data. W. C. Draeger and D. T. Lauer (California, University, Berkeley, Calif.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 333-339. 17 refs. Grant No. NGL-05-003-404.

**A75-17143 #** Evaluation of ERTS-1 and aircraft data for assessing internal drainage in irrigated agriculture. D. W. Ryland, F. A. Schmer, D. G. Moore (South Dakota State University, Brookings, S.D.), and W. A. Lidster (U.S. Bureau of Reclamation, Denver, Colo.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 683-691. U.S. Bureau of Reclamation Contract No. 14-06-D-7358.

Research was conducted to investigate the application of remote sensing techniques for detecting areas with high water tables in irrigated agricultural lands. Aerial data were collected by the ERTS-1 satellite and aircraft over a portion of the Kansas/Bostwick Irrigation District in Republic County, Kansas. Areas having high water tables were visually located on the imagery and verified on the ground. Aircraft and ERTS-1 imagery were digitized and correlated with water table depths. Multiple regression, mode seeking, and K-class classification analyses were also applied to the data. Significant correlations were obtained between water table depths and the aircraft remotely sensed data both for the total area and for specific corn or fallow fields. For a corn field, 91% of the water table depths were correctly classified into depths less than 183 cm and depths greater than 183 cm. Significant correlations were obtained between ERTS-1 bands 5 and 7 and water table depth for both a corn and fallow field. (Author)

**A75-17144 \* #** Use of visible, near-infrared, and thermal infrared remote sensing to study soil moisture. M. B. Blanchard (NASA, Ames Research Center, Moffett Field, Calif.), R. Greeley (Santa Clara, University, Santa Clara, Calif.), and R. Goettelman (LFE Corp., Richmond, Va.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 693-700. 20 refs.

Two methods are used to estimate soil moisture remotely using the 0.4 to 14.0-micron wavelength region: (1) measurement of spectral reflectance, and (2) measurement of soil temperature. The reflectance method is based on observations which show that directional reflectance decreases as soil moisture increases for a given material. The soil temperature method is based on observations which show that differences between daytime and nighttime soil temperatures decrease as moisture content increases for a given material. In some circumstances, separate reflectance or temperature measurements yield ambiguous data, in which case these two methods may be combined to obtain a valid soil moisture determination. In this combined approach, reflectance is used to estimate low moisture levels; and thermal inertia (or thermal diffusivity) is used to estimate higher levels. The reflectance method appears promising for surface estimates of soil moisture, whereas the temperature method appears promising for estimates of near-subsurface (0 to 10 cm). (Author)

**A75-17145 \* #** Moisture detection from Skylab. J. R. Eagleman (Kansas, University, Lawrence, Kan.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 701-705. Contract No. NAS9-13273.



Five sets of data are described which relate the Skylab S193 radiometer and scatterometer data and S194 L-band radiometer temperature to soil moisture content of test sites in Texas and Kansas. Although the analysis of the S193 data are incomplete, analysis of the L-band radiometer data show that it is highly correlated with the soil moisture content of the surface layers of soil. Various correlations and predictions based on the relationship are described in this paper. (Author)

**A75-17146 \* # Remote detection of soil surface moisture.** E. H. Stockhoff and R. T. Frost (GE Space Sciences Laboratory, Philadelphia, Pa.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 707-723. 8 refs. Contract No. NAS5-21689.

Polarimetric data concerning soil surface moisture were obtained during a series of flights over the Imperial Valley, California, and Phoenix, Arizona, during March 1972. A polarimeter was installed in NASA's Convair-990 aircraft, Galileo, above a window in the floor of the aft cargo compartment in such a manner that it could view from 42 deg ahead of, to 42 deg to the rear of the nadir. It had a 3 deg field of view and a 10 nm bandwidth centered at 641 nm. The moisture content of the solid surface for fields viewed by the polarimeter was measured by determining the angle through which the light had been scattered by the soil and by observing the degree of polarization of this light produced during its interaction with the soil. The polarimeter measures this degree of polarization in terms of Stokes parameters. Ground-truth samples of soil were obtained at several depths along the flight path. (Author)

**A75-17158 \* # Skylab S-192 ratio codes of soil, mineral, and rock spectra for ratio image selection and interpretation.** R. K. Vincent and W. W. Pillars (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 875-896. 10 refs. Contracts No. NAS9-13317; No. NAS9-13386.

A limited theoretical systems study is made of the Skylab S-192 12-channel multispectral scanner's capabilities for geological remote sensing. Laboratory spectra of rocks, minerals, soils, and some vegetation were used to rank the twelve channels and the best twelve of the 66 possible nonreciprocal spectral ratios according to their ability to discriminate among 17 classes of geological targets. Environmental and instrumental noise sources were ignored. The S-192 should be most useful for discriminating minerals deposited by hydrothermal alteration, weathering, and evaporation. Discrimination of igneous rocks will be difficult. Ratio images are recommended over automatic discrimination methods for those geological targets that can be enhanced by ratio imaging. Ratio codes were found for the twelve highest ranked ratios, for use in selecting the ratio images which will best enhance a target of interest. They can also be searched for false alarm candidates for a given target. A.T.S.

**A75-17167 \* # Preliminary results of fisheries investigation associated with Skylab-3.** K. Savastano, E. Pastula, Jr., G. Woods (NOAA, National Marine Fisheries Service, Bay St. Louis, Miss.), and K. Faller (NASA, Johnson Space Center, Earth Resources Laboratory, Bay St. Louis, Miss.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1013-1042. 23 refs. NASA Project 240; NASA Order T-8217-B.

The purpose of the 15-month investigation now in the analysis phase is to establish the feasibility of utilizing remotely sensed data acquired from aircraft and satellite platforms to provide information concerning the distribution and abundance of oceanic gamefish. Data

from the test area, jointly acquired by private and professional fishermen and NASA and NOAA/NMFS elements, in the north-eastern Gulf of Mexico has made possible the identification of significant environmental parameters for white marlin. Predictive models based on catch data and surface truth information have been developed and have demonstrated potential for reducing search significantly by identifying areas which have a high probability of being productive. Three of the parameters utilized by the model, chlorophyll-a, sea surface temperature and turbidity have been inferred from aircraft sensor data. (Author)

**A75-17168 # Rapid stock assessment of pilchard populations by aircraft-borne remote sensors.** D. L. Cram (Department of Industries, Sea Fisheries Branch, Cape Town, Republic of South Africa). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1043-1050. 5 refs.

**A75-17169 # Determining range condition and forage production potential in California from ERTS-1 imagery.** D. M. Carnegie and S. D. DeGloria (California, University, Berkeley, Calif.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1051-1059.

**A75-17170 # Grass canopy bidirectional spectral reflectance.** J. E. Colwell (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1061-1085.

The green (550 nm), red (650 nm), and near IR (750 nm) bidirectional reflectance of grass canopies was studied both theoretically and empirically, in order to determine the feasibility of using remote sensing techniques to assess the standing biomass of grasslands. The investigation showed that the optimum spectral bands for remote determination of standing biomass of grasslands vary, depending on such things as the type of vegetation, the range of values of percent vegetation cover present, the soil reflectance, and the look angle and solar zenith angles. No single spectral band can be considered, a priori, to be effective in all situations. (Author)

**A75-17171 # Forest defoliation assessment with satellite imagery.** W. G. Rohde (Earth Satellite Corp., Washington, D.C.) and H. J. Moore (U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Hyattsville, Md.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1089-1104. 7 refs.

A study of ERTS-1 multispectral scanner imagery (MSS) indicates that forest defoliation by insects such as the gypsy moth can be detected from satellite imagery and correlates well with aerial visual survey data. Two damage classes (heavy and moderate to light) and undefoliated areas can be detected by human interpreters from false-color composite imagery. The use of earth resources satellites in an integrated pest detection and control system will require more cloud-free images and more timely data acquisition and dissemination than were possible with ERTS-1. A.T.S.

**A75-17172 # Spectral reflectance studies on mineral deficiency in corn plants.** H. A. Younes, A. G. Abdel-Samie (National Research Centre, Giza, Egypt), R. M. Abdel-Aal (Ministry of Agriculture, Soils and Water Research Institute, Giza, Egypt), and M. M. Khodair (National Institute for Standards, Giza, Egypt). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research

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Institute of Michigan, 1974, p. 1105-1125. Research supported by the Oklahoma State University and NSF.

A sand-culture experiment was conducted to study the possibility of using spectrophotometric reflectance measurements on plant leaves and photography with different films to detect early symptoms of N, P, and K deficiency in corn plants. Experimental procedures, spectrophotometric measurements on single leaves and photography techniques are described and the results are presented in tabulated and illustrated forms. The data revealed that normal and deficient nutrient plants could be differentiated both photographically and photometrically. The differentiation depends on plant age, nutrient element, and the severity of nutrient deficiency. A detectable and noticeable difference in the near infrared spectrum between the nutrient deficient and normal leaves occurred, before any visual symptoms appeared. Photography proved that the best results can be obtained using false color infrared films with No. 25 filter. (Author)

**A75-17173 #** Agricultural resources investigations in Southern France and Northern Italy. In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1127-1159.

A joint French-Italian study was made to evaluate the feasibility of using satellite and aircraft remote sensing to support agronomic research under European ecological conditions. Areas chosen for study included irrigated rice fields and natural (beech forests) and artificial (poplar plantations and coniferous afforestations) forested areas. Eight test sites in France, Italy, and Madagascar were chosen to represent a wide range of climatic conditions. Results on two of the sites are treated. The use of ERTS multispectral scanner imagery makes it possible to evaluate total rice cultivation area and distinguish different varieties of rice. Moreover, it should be possible to distinguish rice varieties from other crops and to distinguish rice fields from natural bodies of water. Studies were also conducted on estimating rice yield, detecting diseased fields, and inventorying poplar plantations by remote sensing. A.T.S.

**A75-17174 #** Thermal behaviour of some rice fields affected by a yellows-type disease. C. De Carolis, G. Baldi (Ente Nazionale Risi, Mortara, Italy); S. Galli de Paratesi (Comitato Nazionale per l'Energia Nucleare, Centro per le Ricerche Comuni, Ispra, Italy), and G. M. Lechi (CNR, Milan, Italy). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1161-1170. 10 refs. Research sponsored by the Centro per le Ricerche Comuni.

Ground-based and airborne near-infrared and thermal-infrared surveys were made to study the radiation behavior of rice fields affected by 'giallume', a yellows-type disease. The near-infrared aerial surveys allowed exact measurement of the vegetative covering of water. The diseased rice areas were found to behave like thermally anomalous areas when compared to healthy areas. The black-body temperature of the diseased areas exceeds that of the healthy areas by several degrees K. A.T.S.

**A75-17175 \* #** First results from the crop identification technology assessment for remote sensing /CITARS/. F. G. Hall (NASA, Johnson Space Center, Houston, Tex.), M. E. Bauer (Purdue University, West Lafayette, Ind.), and W. A. Malila (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1171-1191. 15 refs.

The CITARS task design, including objectives, analysis methodology and experimental procedures, is described and first results from this effort are presented. The extensive ground truth

data set acquired for the CITARS task is described and discussed in some detail. Results of the accuracy tests for the photo interpretative CITARS ground truth are given. Results of the assessment of the ERTS MSS data for cloud cover and electronic quality are presented. Some results of the geometric correction and registration of the time sequential CITARS ERTS data are given. Finally, the field boundary selection problem is addressed and the results of the use of new technology for boundary selection are presented. (Author)

**A75-17176 \* #** ERTS-I data for classifying native plant communities - Central Colorado. R. S. Driscoll, R. E. Francis (U.S. Forest Service, Fort Collins, Colo.), J. A. Smith, and R. A. Mead (Colorado State University, Fort Collins, Colo.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1195-1211. 10 refs. NASA Order S-70251-AG.

**A75-17185 #** Color terrain map of Yellowstone National Park, computer-derived from ERTS MSS data. R. R. Root (National Park Service, Denver, Colo.), H. W. Smedes (U.S. Geological Survey, Denver, Colo.), N. E. G. Roller (Michigan, Environmental Research Institute, Ann Arbor, Mich.), and D. Despain (National Park Service, Yellowstone National Park, Wyo.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1369-1398. 11 refs. Research supported by the U.S. Geological Survey.

**A75-17186 #** Inventories of Delaware's coastal vegetation and land-use utilizing digital processing of ERTS-1 imagery. V. Klemas, D. Bartlett (Delaware, University, Newark, Del.), R. Rogers, and L. Reed (Bendix Corp., Aerospace Systems Div., Ann Arbor, Mich.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1399-1410. 6 refs.

**A75-17187 #** Texture analysis with Fourier series. H. Maurer (Zürich, University, Zurich, Switzerland). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1411-1420. 14 refs. Translation.

Concerning a semi-automated or automated classification system for agricultural crop types from large-scale color aerial photographs, texture leads to excellent parameters for the discrimination. With a single Fourier series analysis textural parameters were computed from average density profiles through crop fields, measured with a ZEISS-Scanning-Microscope-Photometer. Then these parameters were tested with a discriminant analysis for their usefulness for the classification of agricultural crop types. The results are very promising. The combination of the measuring data from two different bands produces a perfect classification of all crop fields. (Author)

**A75-17189 #** Investigation into the spectral signature of agricultural crops during their state of growth. T. A. de Boer (Instituut voor Biologisch en Scheikundig Onderzoek van Landbouwgewassen, Wageningen, Netherlands), N. J. J. Bunnik, H. W. J. van Kasteren, D. Uenk, W. Verhoef (Netherlands Interdepartmental Working Community for the Application of Remote Sensing Techniques, Delft, Netherlands), and G. P. de Loor (Physisch Laboratorium TNO, The Hague, Netherlands). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1441-1455. 15 refs. Research supported by the Fysisch Laboratorium TNO.

The spectral signature from 400 to 2300 nm of 11 crops was determined at different phases of their growth. A fieldspectrometer, constructed according to a new principle and developed in the Netherlands, was used. To reduce the number of parameters that affect the directional reflectance of a canopy in its natural environment, the reflectance was measured only perpendicularly to the field surface while using an artificial light source. The purpose of this investigation was to determine, within the available atmospheric windows, the spectral bands in which the optimal differences between the signatures of different crops during their state of growth could be measured. (Author)

**A75-17190 #** Radar cross sections of vegetation canopies determined by monostatic and bistatic scatterometry. E. P. W. Attema, L. G. den Hollander (Technische Hogeschool Delft, Delft, Netherlands), T. A. de Boer, D. Uenk (Instituut voor Biologisch en Scheikundig Onderzoek van Landbouwgewassen, Wageningen, Netherlands), W. J. Eradus, G. P. de Loor (Fysisch Laboratorium TNO, The Hague, Netherlands), H. van Kasteren, and J. van Kuilenburg (Netherlands Interdepartmental Working Community for the Application of Remote Sensing Techniques, Delft, Netherlands). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1457-1465. 10 refs.

**A75-17216 \* #** Statistical separability of agricultural cover types in subsets of one to twelve spectral channels. R. Kumar and L. Silva (Purdue University, West Lafayette, Ind.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1891-1903. 18 refs. Research supported by the Instituto Nacional de Pesquisas Espaciais of Brazil; Grant No. NGL-15-005-112.

The purpose of this study was to determine the statistical separability of multispectral measurements from agricultural cover types: corn, soybeans, green forage (hay and pasture) and forest, in one to twelve spectral channels. Multispectral scanner data in twelve spectral channels in the wavelength range 0.4 to 11.7 microns, acquired for three flightlines were analysed by applying automatic pattern recognition techniques. The same analysis was performed for the data acquired a month later over the same three flightlines to investigate the effect of time on statistical separability of agricultural cover types. In the subsets of one to six spectral channels, the combination of wavelength regions (where V, N, M and T denote the visible, near infrared, middle infrared and thermal infrared wavelength regions, respectively): V, V M, V N M, V N M T, V V N M T, V V N M M T, respectively, were found to be the best choices for getting good overall statistical separability of the agricultural cover types for the data acquired. (Author)

**A75-17973 \*** Microbial abundance and thermoluminescence of antarctic dry valley soils. J. D. Ingham, R. E. Cameron, and D. D. Lawson (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *Soil Science*, vol. 117, no. 1, 1974, p. 46-57. 10 refs. NSF Grant No. C-585; Contract No. NAS7-100.

**A75-18056** An intensive natural resources inventory aids land use planning and resources management in Puerto Rico. L. H. Liegel (U.S. Forest Service, Institute of Tropical Forestry, Rio Piedras, P.R.) and G. A. del Toro (Puerto Rico Department of Natural Resources, San Juan, P.R.). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1974, p. 57-65. 6 refs.

**A75-18063** Geometronics-earth resource measurements and displays for the Forest Service. J. R. Swinnerton (U.S. Forest Service, Washington, D.C.). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1974, p. 170-177.

More and better information is needed to support land use decisions on the National Forests. In response to this need, a new multilayer mapping system was recently adopted. The objective will be to incorporate special purpose mapping and graphic efforts into a coordinated system, tied to a common base. Concurrently, computer assisted systems are being implemented to streamline data handling. For example, after elevation data is properly formatted and stored, it can be analyzed with software routines which generate slope, aspect, contours, perspective, cross-sections or limits of viewed areas. (Author)

**A75-18066** The use of high altitude photography and ERTS-1 imagery for wildlife habitat inventory in Kansas. J. W. Merchant, Jr. (University of Kansas Center for Research, Inc., Lawrence, Kan.) and B. H. Waddell, Jr. (Kansas Forestry, Fish and Game Commission, Valley Falls, Kan.). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1974, p. 220-231. 8 refs.

**A75-18068** Trends in the use of remote sensing for state resources and environmental management. F. J. Wobber (IBM Corp., Resources Management Dept., Gaithersburg, Md.). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1974, p. 246-255.

Remote sensing programs at the state level reflect many changes in remote sensing technology and particularly a trend towards practical problem-solving. Five state remote sensing case histories are described and analyzed for trends in remote sensing for state resources and environmental management. Trends including the growth of regulatory and legal applications, increased use of information systems and decision modeling, and modifications in user attitudes with respect to the scale of remote sensor records are noted. (Author)

**A75-18073** Optical film density values from color IR photography for wetland soils mapping. S. T. Kim, A. J. Lewis, and P. E. Schilling (Louisiana State University, Baton Rouge, La.). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1974, p. 323-331. 10 refs. Research supported by the Louisiana State University and Joint Legislative Committee on Environmental Quality of the State of Louisiana.

**A75-18556 \*** Radar response to vegetation. F. T. Ulaby (University of Kansas Center for Research, Inc., Lawrence, Kan.). *IEEE Transactions on Antennas and Propagation*, vol. AP-23, Jan. 1975, p. 36-45. 14 refs. Contract No. NAS9-10261; Grant No. DAAK02-68-C-0089.

Active microwave measurements of vegetation backscatter were conducted to determine the utility of radar in mapping soil moisture through vegetation and mapping crop types. Using a truck-mounted boom, spectral response data were obtained for four crop types (corn, milo, soybeans, and alfalfa) over the 4-8 GHz frequency band, at incidence angles of 0 to 70 degrees in 10-degree steps, and for all four linear polarization combinations. Based on a total of 125 data sets covering a wide range of soil moisture, content, system design criteria are proposed for each of the aforementioned objectives.

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Quantitative soil moisture determination was best achieved at the lower frequency end of the 4-8 GHz band using HH polarized waves in the 5- to 15-degree incidence angle range. A combination of low and high frequency measurements are suggested for classifying crop types. For crop discrimination, a dual-frequency dual-polarization (VV and cross) system operating at incidence angles above 40 degrees is suggested. (Author)

**N75-10543\*#** Northern Prairie Wildlife Research Center, Jamestown, N. Dak.

### UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Oct. 1974

David S. Gilmer, Principal Investigator Oct. 1974 4 p EREP (NASA Order T-4114-B)

(E74-10817; NASA-CR-140619) Avail: NTIS HC \$3.25 CSCL 06C

**N75-10544\*#** Arizona Univ., Tucson. Office of Arid Lands Studies.

### A STUDY TO EXPLORE THE USE OF ORBITAL REMOTE SENSING TO DETERMINE NATIVE ARID PLANT DISTRIBUTION Biannual Progress Report and Final Report

W. G. McGinnies, Principal Investigator, L. K. Lepley, E. F. Haase, J. S. Conn, H. B. Musick, and K. E. Foster Aug. 1974 38 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(Contract NAS5-21812)

(E74-10818; NASA-CR-140620) Avail: NTIS HC \$3.75 CSCL 08F

The author has identified the following significant results. It is possible to determine, from ERTS imagery, native arid plant distribution. Using techniques of multispectral masking and extensive fieldwork, three native vegetation communities were defined and mapped in the Avra Valley study area. A map was made of the Yuma area with the aid of ground truth correlations between areas of desert pavement visible on ERTS images and unique vegetation types. With the exception of the Yuma soil-vegetation correlation phenomena, only very gross differentiations of desert vegetation communities can be made from ERTS data. Vegetation communities with obvious vegetation density differences such as saguaro-paloverde, creosote bush, and riparian vegetation can be separated on the Avra Valley imagery while more similar communities such as creosote bush and saltbush could not be differentiated. It is suggested that large differences in vegetation density are needed before the signatures of two different vegetation types can be differentiated on ERTS imagery. This is due to the relatively insignificant contribution of vegetation to the total radiometric signature of a given desert scene. Where more detailed information concerning the vegetation of arid regions is required, large scale imagery is appropriate.

**N75-10557\*** Environmental Research Inst. of Michigan, Ann Arbor.

### UTILITY OF ERTS FOR MONITORING THE BREEDING HABIT OF MIGRATORY WATERFOWL

Edgar W. Work, Jr., David S. Gilmer (Northern Prairie Wildlife Res. Center), and A. T. Klett (Northern Prairie Wildlife Res. Center) In NASA. Goddard Space Flight Center Third ERTS Symp., Vol. 2 May 1974 p 102-115 refs

CSCL 06C

Waterfowl breeding-ground surveys conducted each year by the Bureau of Sport Fisheries and Wildlife extend over a vast region of the United States and Canada. Data from these surveys are used to estimate waterfowl production by means of a mathematical model. Counts of May and July ponds are some of the variables used in this model. Annual production estimates are used to predict fall flights of ducks. This information is then used for establishing waterfowl hunting regulations. Work to date

indicates that satellite remote sensing techniques hold considerable promise for the accurate and rapid assessment of waterfowl breeding habitat, especially changes in pond numbers and distribution. Development of an operational system utilizing satellite sensors as a primary source of data appears to be a realistic goal for the future. Author

**N75-10558\*** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Tex.

### AGRICULTURE, FORESTRY, RANGE RESOURCES

Robert B. MacDonald In its Third ERTS Symp., Vol. 2 May 1974 p 116-125

CSCL 08F

The necessary elements to perform global inventories of agriculture, forestry, and range resources are being brought together through the use of satellites, sensors, computers, mathematics, and phenomenology. Results of ERTS-1 applications in these areas, as well as soil mapping, are described. A.L.

**N75-10577#** Mathematical Applications Group, Inc., Elmsford, N.Y.

### AN EXTENSION OF THE COMBINATORIAL GEOMETRY TECHNIQUE FOR MODELING VEGETATION AND TERRAIN FEATURES Final Contract Report

Joan Brooks, Ragini S. Murarka, Daniel Onuoha, Frank H. Rahn, and Herbert A. Steinberg Jun. 1974 52 p refs

(Contract DAAD05-73-C-0537; DA Proj. 1G6-62708-D-05) (AD-782883; BRL-CR-159) Avail: NTIS CSCL 08/2

An extended version of the MAGI (Mathematical Applications Group, Inc.) Combinatorial Geometry technique has been developed which is capable of realistic modeling of trees and bushes. The method has been demonstrated photographically using the SYNTHAVISION process developed by MAGI. Although the basic modeling techniques are those of the standard Combinatorial Geometry method, major extensions have been introduced to reduce the strains on computer memory and computer time that are inherent in a complex description. The method will eventually be capable of integrating the tree and bush model with models of terrain features, camouflage nets and BRL-COMGEOM descriptions of vehicles. These features of the program are in progress but not yet complete.

Author (GRA)

**N75-12277\*#** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

### SYSTEMS STUDY OF AN AUTOMATED FIRE WEATHER DATA SYSTEM

Kenji Nishioka Oct. 1974 70 p refs

(NASA-TM-X-62402) Avail: NTIS HC \$4.25 CSCL 14B

A sensor system applicable to an automated weather station was developed. The sensor provides automated fire weather data which correlates with manual readings. The equipment and methods are applied as an aid to the surveillance and protection of wildlands from fire damage. The continuous readings provided by the sensor system make it possible to determine the periods of time that the wilderness areas should be closed to the public to minimize the possibilities of fire. Author

**N75-12394\*#** South Dakota State Univ., Brookings. Remote Sensing Inst.

### DEVELOP TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS, TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL Monthly Progress Report, Sep. 1974

Victor I. Myers, Principal Investigator 20 Oct. 1974 2 p EREP

(Contract NAS9-13337)

(E75-10012; NASA-CR-140654) Avail: NTIS HC \$3.25 CSCL 08F



**N75-12402\*#** Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.

**INVENTORY OF FOREST AND RANGELAND RESOURCES, INCLUDING FOREST STRESS** Bimonthly Progress Report, 16 Sep. - 15 Nov. 1974

Robert C. Aldrich, Frederick P. Weber, and Richard S. Driscoll, Principal Investigators 18 Nov. 1974 7 p EREP

(NASA Order T-4106-B)

(E75-10032; NASA-CR-140762; BMPR-14) Avail: NTIS HC \$3.25 CSCL 02F

**N75-12403\*#** South Dakota State Univ., Brookings. Remote Sensing Inst.

**DEVELOP TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS, TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL** Monthly Progress Report, Oct. 1974

Victor I. Myers, Principal Investigator 20 Nov. 1974 2 p EREP

(Contract NAS9-13337)

(E75-10033; NASA-CR-140763) Avail: NTIS HC \$3.25 CSCL 08F

**N75-12405\*#** Kansas Univ. Center for Research, Inc., Lawrence. Atmospheric Science Lab.

**DETECTION OF MOISTURE AND MOISTURE RELATED PHENOMENA FROM SKYLAB** Monthly Progress Report, Sep. 1974

Joe R. Eagleman, Principal Investigator and Norman Hardy Sep. 1974 7 p EREP

(Contract NAS9-13273)

(E75-10035; NASA-CR-140772; TR-239-17) Avail: NTIS HC \$3.25 CSCL 08B

**N75-12414\*#** Agricultural Research Service, Weslaco, Tex. **IRRIGATION SCHEDULING, FREEZE WARNING AND SOIL SALINITY DETECTING** Monthly Progress Report, Oct. 1974

Craig L. Wiegand, Principal Investigator Oct. 1974 3 p EREP (NASA Order T-4105-B)

(E75-10046; NASA-CR-140783; MPR-10) Avail: NTIS HC \$3.25 CSCL 02C

**N75-12419\*#** Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.

**FEASIBILITY STUDY ASCS REMOTE SENSING/ COMPLIANCE DETERMINATION SYSTEM** Final Report

I. E. Duggan, T. C. Minter, Jr., B. H. Moore, and C. T. Nosworthy Jan. 1973 137 p refs

(Contract NAS9-12200)

(NASA-CR-134288; EO-126) Avail: NTIS HC \$5.75 CSCL 05B

A short-term technical study was performed by the MSC Earth Observations Division to determine the feasibility of the proposed Agricultural Stabilization and Conservation Service Automatic Remote Sensing/Compliance Determination System. For the study, the term automatic was interpreted as applying to an automated remote-sensing system that includes data acquisition, processing, and management. Author

**N75-12421\*#** Minnesota Univ., Minneapolis. Space Science Center.

**A STUDY OF MINNESOTA FORESTS AND LAKES USING DATA FROM EARTH RESOURCES TECHNOLOGY SATELLITES** Twenty-four Month Progress Report, Jul. 1974

30 Jun. 1974 246 p refs

(Grant NGL-24-005-263)

(NASA-CR-140865) Avail: NTIS HC \$7.50 CSCL 08F

Highlights of research and practical benefits are discussed for the following projects which utilized ERTS 1 data to provide municipal, state, federal, and industrial users with environmental resource information for the state of Minnesota: (1) forest disease detection and control; (2) evaluation of water quality by remote sensing techniques; (3) forest vegetation classification and management; (4) detection of saline soils in the Red River Valley; (5) snowmelt flood prediction; (6) remote sensing applications to hydrology; (7) Rice Creek watershed project; (8) water quality in Lake Superior and the Duluth Superior Harbor; and (9) determination of Lake Superior currents from turbidity patterns.

A.A.D.

**N75-12423\*#** ECON, Inc., Princeton, N.J.

**THE VALUE OF IMPROVED (ERS) INFORMATION BASED ON DOMESTIC DISTRIBUTION EFFECTS OF U.S. AGRICULTURE CROPS**

David F. Bradford, Harry H. Kelejian, Richard Brusch, Jonathan Gross, Herbert Fishman, and Daniel Feenberg 31 Oct. 1974 114 p refs

(Contract NASw-2558)

(NASA-CR-141046; Rept-74-2001-5) Avail: NTIS HC \$5.25 CSCL 02B

The value of improving information for forecasting future crop harvests was investigated. Emphasis was placed upon establishing practical evaluation procedures firmly based in economic theory. The analysis was applied to the case of U.S. domestic wheat consumption. Estimates for a cost of storage function and a demand function for wheat were calculated. A model of market determinations of wheat inventories was developed for inventory adjustment. The carry-over horizon is computed by the solution of a nonlinear programming problem, and related variables such as spot and future price at each stage are determined. The model is adaptable to other markets. Results are shown to depend critically on the accuracy of current and proposed measurement techniques. The quantitative results are presented parametrically, in terms of various possible values of current and future accuracies. N.R.

**N75-12518** Joint Publications Research Service, Arlington, Va. **AUTOMATED REMOTE MEASURING SYSTEM IN AGRO-METEOROLOGY**

V. A. Kovalenko, A. D. Kleshchenko, and O. V. Virchenko *In its Meteorology and Hydrol.*, No. 9, 1974 (JPRS-83569) 2 Dec. 1974 p 110-116 refs. Transl. into ENGLISH from Meteorol. Gidrol. (Moscow), no. 9, 1974 p 93-97

An automated data gathering and processing system for aerophotometric investigations of the planted fields of farm crops was studied. A functional diagram is presented and its operation is described. A brief description is given for the individual assemblies of the system and the set of programmed moduli for processing the incoming information. Author

**N75-13333\*#** Kansas Univ. Center for Research, Inc., Lawrence. Space Technology Center.

**DETECTION OF MOISTURE AND MOISTURE RELATED PHENOMENA FROM SKYLAB** Monthly Progress Report, Oct. 1974

Joe R. Eagleman, Principal Investigator and Richard Sloan Oct. 1974 4 p EREP

(Contract NAS9-13273)

(E75-10007; NASA-CR-140586; TR-239-18) Avail: NTIS HC \$3.25 CSCL 08H

## 01 AGRICULTURE AND FORESTRY

**N75-13345\*#** American Univ., Washington, D.C. Drought Analysis Lab.

### **UTILIZATION OF ERTS-1 IMAGERY IN CULTIVATION AND SETTLEMENT SITE IDENTIFICATION AND CARRYING CAPACITY ESTIMATES IN UPPER VOLTA AND NIGER**

Priscilla Reining Nov. 1973 172 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(Contract NAS5-21970)

(E75-10029; NASA-CR-140570) Avail: NTIS HC \$6.25 CSCL 08B

**N75-13361\*#** Northern Prairie Wildlife Research Center, Jamestown, N. Dak.

### **UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Nov. 1974**

David S. Gilmer, Principal Investigator Nov. 1974 2 p EREP (NASA Order T-4114-B)

(E75-10061; NASA-CR-141001) Avail: NTIS HC \$3.25 CSCL 08C

**N75-13362\*#** Agricultural Research Service, Weslaco, Tex. **A STUDY OF THE EARLY DETECTION OF INSECT INFESTATIONS AND DENSITY/DISTRIBUTION OF HOST PLANTS Progress Report, Jun. 1974**

William G. Hart, Sammy J. Ingle, and M. R. Davis, Principal Investigators 30 Jun. 1974 2 p EREP

(NASA Order T-4109-B)

(E75-10062; NASA-CR-141002; PR-17) Avail: NTIS HC \$3.25 CSCL 08F

The author has identified the following significant results. Significant results have been obtained in the identification of citrus, sugarcane, winter vegetables, irrigated pastures, and unimproved pastures which contain brush. Land without vegetation, lakes, roads, and waterways can also be determined. Different densities of vegetation covering some cultivated areas are apparent. The practical applications of these results are many. The abundance of host plants of pests can be determined. Avenues of entry of pests can be plotted, facilitating control or preventing entry of pest species. The boundaries of areas to be quarantined can be accurately established after viewing the S-190B data. Better cultural methods can be employed such as planning where to plant certain crops that indirectly are detrimental to those already growing. This would relate to such factors as pesticide drift or alternate hosts of major pests.

**N75-13363\*#** North Carolina State Univ., Raleigh. School of Physical and Mathematical Sciences.

### **UTILIZATION OF EREP DATA IN GEOLOGICAL EVALUATION REGIONAL PLANNING, FOREST MANAGEMENT, AND WATER MANAGEMENT IN NORTH CAROLINA Quarterly Progress Report, Sep. - Nov. 1974**

Charles W. Welby, Principal Investigator 13 Dec. 1974 3 p EREP

(Contract NAS9-13321)

(E75-10063; NASA-CR-141003) Avail: NTIS HC \$3.25 CSCL 08B

**N75-13503\*#** National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

### **BESMEX: BERING SEA MARINE MAMMAL EXPERIMENT**

G. Carleton Ray and Douglas Wartzok Oct. 1974 55 p refs Prepared in cooperation with Johns Hopkins Univ. Original contains color illustrations

(NASA-TM-X-62399) Avail: NTIS HC \$4.25 CSCL 08C

Predictive ecological models are being studied for the management and conservation of the walrus, and the bowhead whale in the Bering Sea. The influence of sea ice on the distribution, and carrying capacity of the area for these two mammals is to be investigated with the primary target species being the walrus. Remote sensing and radio tracking is considered a requirement for assessing the walrus ecosystem. F.O.S.

**N75-14192\*#** Kansas Univ. Center for Research, Inc., Lawrence. Atmospheric Science Lab.

### **DETECTION OF MOISTURE AND MOISTURE RELATED PHENOMENA FROM SKYLAB Monthly Progress Report, Nov. 1974**

Joe R. Eagleman, Principal Investigator and Wen C. Lin Nov. 1974 14 p EREP

(Contract NAS9-13273)

(E75-10073; NASA-CR-141098; TR-239-20) Avail: NTIS HC \$3.25 CSCL 08H

The author has identified the following significant results. The high correlations between radiometric temperature and soil moisture content are shown to remain quite high for independent footprints of the S194 sensor. Since an analysis based on overlapping footprints had previously been reported with a high correlation, it was necessary to verify that the correlation did not arise from dependent data.

**N75-14196\*#** South Dakota State Univ., Brookings. Remote Sensing Inst.

### **DEVELOP TECHNIQUES AND PROCEDURES, USING MULTISPECTRAL SYSTEMS, TO IDENTIFY FROM REMOTELY SENSED DATA THE PHYSICAL AND THERMAL CHARACTERISTICS OF PLANTS AND SOIL Monthly Progress Report, Nov. 1974**

Victor I. Myers, Principal Investigator 20 Dec. 1974 2 p EREP

(Contract NAS9-13337)

(E75-10077; NASA-CR-141094) Avail: NTIS HC \$3.25 CSCL 08F

**N75-14202\*#** Agricultural Research Service, Weslaco, Tex. **IRRIGATION SCHEDULING, FREEZE WARNING AND SOIL SALINITY DETECTING Monthly Progress Report, Dec. 1974**

Craig L. Wiegand, Principal Investigator Dec. 1974 5 p EREP

(NASA Order T-4105-B)

(E75-10084; NASA-CR-141108; MPR-12) Avail: NTIS HC \$3.25 CSCL 02C

**N75-14241** London Univ. (England). Bedford Coll. **RECOGNITION AND INTERPRETATION OF SPECTRAL SIGNATURES OF VEGETATION FROM AIRCRAFT AND SATELLITE IMAGERY IN WESTERN QUEENSLAND, AUSTRALIA**

Monica M. Cole, E. S. Owen-Jones, N. D. E. Custance, and T. E. Beaumont In ESRO European Earth Resources Satellite Expts. May 1974 p 243-287 refs Original contains color illustrations (For availability see N75-14216 05-43)

The spectral signatures of vegetation communities recognized on multispectral photography, at scales of 1:15,000 and 1:5000, in the Mary Kathleen-Cloncurry and Dugald River areas of Australia were evaluated with reference of specific environmental parameters, notably bedrock mineralization, and were compared with those detectable on the ERTS-1 satellite imagery. Overlays of the spectral signature units including those subjected to enhancement techniques were prepared and computer output histograms of the geochemical and biogeochemical data generated. The distribution of vegetation associations, soil and rock types along each transect was classified by an unsuper-

vised learning type of analysis using a hierarchical fusion-cluster method. Each individual sample along the transect was specified by its reflectance on the eight spectral bands provided by the photographic imagery and clustering was applied in both the images and measurement space. The results of both methods were compared, when it was found that a hybrid method gave the best results. Author (ESRO)

**N75-14247** International Inst. for Aerial Survey and Earth Sciences, Enschede (Netherlands).

**PRELIMINARY RESULTS OF THE INTERPRETATION OF ERTS-1 IMAGERY FOR SOIL SURVEYS IN THE MERIDA REGION, SPAIN**

F. W. Hilwig, D. Goosen, and D. Katsieris / In ESRO European Earth Resources Satellite Expts. May 1974 p 349-361 refs (For availability see N75-14216 05-43)

The potential of ERTS-1 imagery for soil surveying was evaluated. The imagery was related to the results of an aerial survey training and research project carried out in the Merida region in Spain over the past six years. Both black and white and color imagery was studied using various bands and a number of filter and illumination combinations. Preliminary results seem promising. Major landforms and some subdivisions could be easily recognized. Water bodies, river courses, extensive areas of Miocene clays, and more recent coarse-textured deposits could be delineated and existing soil maps at scales up to 1:100,000 could be updated. ERTS-1 imagery promises to be very valuable for generalized or exploratory surveys at small scales up to 1:500,000, valuable for reconnaissance surveys at scales up to 1:100,000, and useful for surveys at scales up to 1:50,000 in conjunction with conventional aerial photointerpretation.

Author (ESRO)

**N75-14251** Bristol Univ. (England).

**GROUND-TRUTH MEASUREMENTS IN RELATION TO AIRCRAFT AND SATELLITE STUDIES OF AGRICULTURAL LAND USE AND LAND CLASSIFICATION IN BRITAIN**

L. F. Curtis and A. J. Hooper (Min. of Agr., London) / In ESRO European Earth Resources Satellite Expts. May 1974 p 405-415 refs

Examples are given of ground truth collection in relation to ERTS-1 and aircraft sensing data for southwest Britain. These demonstrate that the concept of a ground truth site will vary according to the user's objective and the size of the area under study. The range of ground-truth data necessary for evaluation of remote sensing data collection techniques in respect of land-classification and agricultural land use studies are summarized. Estimates of the manpower requirements are given on the basis of two study programs. General problems of ground data collection are considered in respect of timing of observations, crop height, crop roughness, crop color, perspective, soil exposure, agricultural treatments, etc. Specific problems of data recording are discussed in relation to selected crops. Standardization of ground truth recording techniques for agricultural and land classification studies is described. Author (ESRO)

**N75-14252** Consiglio Nazionale delle Ricerche, Milan (Italy). Lab. per la Geofisica della Litosfera.

**AGRICULTURAL RESOURCES INVESTIGATIONS IN NORTHERN ITALY, SOUTHERN FRANCE AND MADAGASCAR**

R. Cassinis, M. Guyader (Centre d'Etudes Spatiales des Rayonnements, Toulouse), and S. GalliDeParatesi (Joint Res. Centre, Ispra, Italy) / In ESRO European Earth Resources Satellite Expts. May 1974 p 417-437 Original contains color illustrations

Under a program of collaboration between the Commission of the European Communities and various specialized national institutes, the project is designed to utilize data from ERTS-B and aircraft flights for research into rice growing and forestry.

Ground experiments have been concerned mainly with the preparation of bio-climatological measurements and automation of their collection, as well as the methods of recording ground truth. By microdensitometric processing of ERTS-1 images of the Camargue, it was possible to identify rice fields before sowing. Owing a radiometry campaign with lysimeters, a series of aircraft flights with an IR camera, a four-channel radiometer, a two-channel thermal IR scanner, and thermographic surveys, it was possible to obtain details of several problems affecting rice fields in Northern Italy. The preliminary results form a basis for the exploitation of ERTS-B data. Author (ESRO)

**N75-14253\*** National Aeronautics and Space Administration, Washington, D.C.

**FUTURE US ACTIVITIES BASED ON EXPERIENCE GAINED FROM ERTS-1 AND EREP**

G. Thorley / In ESRO European Earth Resources Satellite Expts. May 1974 p 439-447

Current and future U.S. activities in the fields of land use, agriculture, forestry, and water resources are summarized. ESRO

**N75-14258#** Army Foreign Science and Technology Center, Charlottesville, Va.

**MORPHOGRAPHIC AND MORPHOMETRIC ANALYSIS OF VEGETATIVE COVER PHOTOGRAPHS IN AERIAL PHOTOGRAPHY FOR THE MAPPING OF VEGETATION**

B. V. Vinogradov 1 Nov. 1973 11 p refs Transl. into ENGLISH from the book "Krupnomasshtabnoe Kartografirovaniye Rastitelnosti" Novosibirsk, Nauka, 1970 p 96-101

(AD-785932; FSTC-HT-23-1296-73) Avail: NTIS CSCL 08/2

Contour boundaries and transition areas provide the greatest amount of information to the eye in the interpretation of photo images; this principle can be applied to the mapping of vegetation by aerial photography. The article discusses a variety of morphographic landform classifications, their relation to geobotanical interpretation, and means and methods for gathering and processing statistical information from aerial photographs. The value of statistical methods in simplifying field work is stressed.

GRA

**N75-15097\*\*** Kanner (Leo) Associates, Redwood City, Calif. **PRELIMINARY DATA ON THE UHF RADIOMETRIC RESEARCH OF SOIL WETNESS, CONDUCTED IN THE USSR, IN 1974**

A. Ye. Basharinov, L. F. Borodin, G. I. Chukhray, and A. M. Shutko Washington NASA Jan. 1975 15 p Transl. into ENGLISH of "Predvaritel'nyye materialy SVCh radiometricheskikh issledovaniy vlazhnosti pochv. provedennykh v SSSR v techeniye 1974 g" report, (Moscow), Acad. of Sci. USSR, 1975 15 p (Contract NASw-2481)

(NASA-TT-F-16151) Avail: NTIS HC \$3.25 CSCL 08M

Aircraft studies of the radiation characteristics of moist soils were performed in several regions of the U.S.S.R.. Radiometers installed on board an IL-14 aircraft were used for obtaining radiation measurements. The characteristics of the regions and their agricultural-meteorological conditions during these measurements are presented along with surface measurements and photographs. Data tables explaining the measurement results are included. M.J.S.

**N75-15105\*\*** Northern Prairie Wildlife Research Center, Jamestown, N. Dak.

**UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Dec. 1974**

David S. Gilmer, Principal Investigator Dec. 1974 2 p EREP (NASA Order T-4114-B)

(E75-10087; NASA-CR-141151) Avail: NTIS HC \$3.25 CSCL 06C

## 01 ARGICULTURE AND FORESTRY

**N75-15115\*#** Wyoming Univ., Laramie. Remote Sensing Lab.

**USEFULNESS OF SKYLAB COLOR PHOTOGRAPHY AND ERTS-1 MULTISPECTRAL IMAGERY FOR MAPPING RANGE VEGETATION TYPES IN SOUTHWESTERN WYOMING**  
**Special Report**

Robert C. Gordon, Principal Investigator [1974] 56 p refs  
ERTS and EREP

(Contracts NAS5-21799; NAS9-13298)

(E75-10097; NASA-CR-141293) Avail: NTIS HC \$4.25 CSCL  
08B

The author has identified the following significant results. Aerial photography at scales of 1:43,400 and 1:104,500 was used to evaluate the usefulness of Skylab color photography (scales of 1:477,979 and 1:712,917) and ERTS-1 multispectral imagery (scale 1:1,000,000) for mapping range vegetation types. The project was successful in producing a range vegetation map of the 68,000 acres of salt desert shrub type in southwestern Wyoming. Techniques for estimation of above-ground green biomass have not yet been confirmed due to the mechanical failure of the photometer used in obtaining relative reflectance measurement. However, graphs of log transmittance versus above-ground green biomass indicate that production estimates may be made for some vegetation types from ERTS imagery. Other vegetation types not suitable for direct ERTS estimation of green biomass may possibly be related to those vegetation types whose production has been estimated from the multispectral imagery.

**N75-15125\*#** Agricultural Research Service, Weslaco, Tex.  
**IRRIGATION SCHEDULING, FREEZE WARNING AND SOIL SALINITY DETECTING Monthly Progress Report, Jan. 1975**

Craig L. Wiegand, Principal Investigator Jan. 1975 4 p EREP  
(NASA Order T-4105-B)

(E75-10109; NASA-CR-140899; MPR-13) Avail: NTIS  
HC \$3.25 CSCL 02C

**N75-15146#** Army Foreign Science and Technology Center, Charlottesville, Va.

**USE OF FOREST VEGETATION AS AN INDICATOR IN THE INTERPRETATION AND LARGE SCALE MAPPING OF SOILS IN A FOREST ZONE**

A. M. Berezin 19 Nov. 1973 14 p refs Transl. into ENGLISH  
from the book "Krupnomasshtabnoe Kartografiya Rastitelnosti"  
Novosibirsk, 1970 p 102-110

(AD-785967; FSTC-HT-23-1297-73) Avail: NTIS CSCL  
08/13

Field research into forest types and their relations to soil types, types of tertiary deposits and underlying rocks were correlated with interpretation of the same items from aerial photographs, in selected regions of the Ukraine and Karelia. Aerial spectral region photographs proved to be more suitable than black and white aerial photos. The relationship of alluvial-slopewash deposits to ravine black alder, thick fluvioglacial sands covered with foxberry pine forests and organogenic deposits with rosemary-sphagnum pine forests are the most clearly interpreted from aerial photos. Further investigations in other regions should allow generalization of the results and their introduction into forest zone soil and tertiary deposit mapping. GRA

## 02

## ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

Includes land use analysis, urban and metropolitan studies, environmental impact, air and water pollution, geographic information systems, and geographic analysis.

**A75-11103 #** Morning-evening asymmetry of the thermosphere during a geomagnetic disturbance (Utrenne-vecherniaia asimetriia termosfery v period geomagnitnogo vozrushcheniia). V. V. Katiushina and Iu. A. Romanovskii (Glavnoe Upravlenie Gidrometeorologicheskoi Sluzhby SSSR, Institut Prikladnoi Geofiziki, Moscow, USSR). *Akademiia Nauk SSSR, Doklady*, vol. 217, Aug. 11, 1974, p. 1057-1060. 8 refs. In Russian.

**A75-11211 \*** The earth as a radio source - Terrestrial kilometric radiation. D. A. Gurnett (Iowa, University, Iowa City, Iowa). *Journal of Geophysical Research*, vol. 79, Oct. 1, 1974, p. 4227-4238. 17 refs. Contracts No. NAS5-11074; No. NAS5-11431; No. N00014-68-A-0196-0009; Grant No. NGL-16-001-043.

Based on Imp 6 and 8 satellite observation data, a comprehensive study of terrestrial kilometric radiation is presented. In the light of these data, the earth appears to be a very intense planetary radio source, with a total power output comparable to the decametric radio emission from Jupiter. Terrestrial kilometric (i.e., about 50-500 kHz) radiation seems to originate from low altitudes in the auroral region. M.V.E.

**A75-11221 \*** Magnetopause rotational forms. B. U. O. Sonnerup (Dartmouth College, Hanover, N.H.) and B. G. Ledley (NASA, Goddard Space Flight Center, Greenbelt, Md.). *Journal of Geophysical Research*, vol. 79, Oct. 1, 1974, p. 4309-4314. 17 refs. Grant No. NGR-30-001-040.

Magnetic field data from the Goddard Space Flight Center magnetometer experiment on board Ogo 5 are analyzed by the minimum-variance technique for two magnetopause crossings, believed to provide the best evidence presently available of magnetopause rotational discontinuities. Approximate agreement with predictions from MHD and first-order orbit theory is found, but available low-energy electron data suggest the presence of significant non-MHD effects. The paper also illustrates an improved method for data interval selection, a new magnetopause hodogram representation, and the utility of data simulation. (Author)

**A75-12037 \*** Skylab induced environment. R. J. Naumann (NASA, Marshall Space Flight Center, Huntsville, Ala.). *American Institute of Aeronautics and Astronautics and American Geophysical Union, Conference on Scientific Experiments of Skylab*, Huntsville, Ala., Oct. 30-Nov. 1, 1974, AIAA Paper 74-1225. 7 p. 10 refs.

This induced environment consists of particles and gases which emanate from the spacecraft in orbit and form the 'contamination cloud'. The presence of the cloud can present certain problems connected with scattering effects and the deposition of condensibles on optical surfaces. Measures taken to investigate these effects involved the placement of quartz crystal microbalance deposition monitors at certain locations to determine molecular film build-up during the flight. G.R.

**A75-12803 \*** On evaluating compliance with air pollution levels 'not to be exceeded more than once a year'. H. E. Neustadter and S. M. Sidik (NASA, Lewis Research Center, Energy Conversion and Materials Science Div., Cleveland, Ohio). *Air Pollution Control Association, Journal*, vol. 24, June 1974, p. 559-563. 11 refs.

Under a sampling program operated in conformity with EPA guidelines, calculational procedures are described for estimating the corresponding ambient pollution level. The statistical independence of the data, the commutativity of expectation and exponential operations, and the statistical variability of the calculated results are quantitatively evaluated. It is shown that the recommended sampling frequencies of every third to every sixth day are inadequate in determining conformity when the standards are expressed as levels not to be exceeded more than once a year. T.S.

**A75-13576** Technology today for tomorrow; Proceedings of the Eleventh Space Congress, Cocoa Beach, Fla., April 17-19, 1974. Volumes 1 & 2. Congress sponsored by the Canaveral Council of Technical Societies, Cape Canaveral, Fla., Canaveral Council of Technical Societies, 1974. Vol. 1, 199 p.; vol. 2, 177 p. Price of two volumes, \$21.25.

The topics discussed are related to an evaluation of Skylab payoffs, the benefits of space exploration, earth resources programs, the space shuttle, the utilization of foreign technology, and the marine sciences. Questions of planetary exploration are investigated, giving attention to the science of the Viking missions, Pioneer missions to Jupiter, the Mariner Jupiter/Saturn 1977 mission, and ballistic missions to the comet Encke in 1980. Subjects considered in the area of meteorology are related to an industry view of earth observation programs, technology for television meteorologists, rainfall estimations from geosynchronous satellite imagery, and an expansion of the meteorological satellite potential.

G.R.

**A75-13577 \*** Skylab earth resources program. V. R. Wilmarth (NASA, Johnson Space Center, Houston, Tex.). In: *Technology today for tomorrow; Proceedings of the Eleventh Space Congress, Cocoa Beach, Fla., April 17-19, 1974. Volume 1.*

Cape Canaveral, Fla., Canaveral Council of Technical Societies, 1974, p. 1-1 to 1-13.

A unique space platform for studying the ocean, the land, and atmospheric phenomena of the planet earth was provided by the successful launch of Skylab on May 14, 1973. The crew members surveyed selected portions of this planet with an array of photographic, infrared, and microwave sensors. These sensors formed the Earth Resources Experiment Package (EREP). Approximately 40,000 photographs and 220,000 feet of high density magnetic tape were acquired with EREP. Details regarding the sensors are discussed along with the results obtained in the investigations. G.R.

**A75-13757 #** Thermal emission of agglomerations as recorded on environmental satellite imagery. H. Kaminski (Bochum, Sternwarte, Bochum, West Germany). *International Astronautical Federation, International Astronautical Congress, 25th, Amsterdam, Netherlands, Sept. 30-Oct. 5, 1974, Paper 74-139*. 56 p. 29 refs.

The high-resolution IR radiometer of the satellites NOAA 2 and NOAA 3 makes it possible to determine the heat accumulation and emission in and from large towns. The film density of IR images obtained from the two satellites during the time from March 1973 and June 1974 was used to correlate the surface radiation temperature of the agglomeration and its environment for a number of cities in Europe, including London, Paris, Antwerp, Brussels, Duisburg, Frankfurt, Bremen, Hamburg, and Berlin. G.R.

**A75-13760 #** Comparison of existing earth resources data processing facilities. G. P. Fishman (General Electric Co., Philadelphia, Pa.). *International Astronautical Federation, International Astronautical Congress, 25th, Amsterdam, Netherlands, Sept. 30-Oct. 5, 1974, Paper 74-144*. 16 p.

## 02 ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

The paper provides readers potentially interested in establishing their own capability for accessing ERTS data, with an overview of the ground systems currently in operation in the U.S., Canada, and Brazil, and under active development in Italy and the Federal Republic of Germany. The reader is cautioned to look upon these facilities as examples only. There are many ways to implement ERTS ground systems ranging from small, relatively inexpensive options to large, complex, and costly implementations. Each implementation plan should be carefully analyzed to fit the needs and budget of the prospective user. F.R.L.

**A75-14841 \* #** Nimbus 4 observations of changes in total ozone and stratospheric temperatures during a sudden warming. A. Ghazi (NASA, Goddard Space Flight Center, Greenbelt, Md.). *Journal of the Atmospheric Sciences*, vol. 31, Nov. 1974, p. 2197-2206. 14 refs.

**A75-16675 \* #** The detection of dust storms over land and water with satellite visible and infrared measurements. W. E. Shenk and R. J. Curran (NASA, Goddard Space Flight Center, Greenbelt, Md.). *Monthly Weather Review*, vol. 102, Dec. 1974, p. 830-837. 8 refs.

The position of a large area of dust was successfully located over the Sahara Desert and off the west coast of Africa with infrared measurements from the Temperature Humidity Infrared Radiometer (THIR) and visible information from the Image Dissector Camera System (IDCS) on Nimbus 4 between 20 and 25 April 1970. Over land, near midday, the dust areas were associated with lower equivalent blackbody temperatures (TBB's) than in the surrounding areas due to the mixing of the dust with the cooler air just above the surface. Near midnight dust areas appeared to be located where the TBB's were higher than the surrounding regions. The TBB contrast was insufficient for dust detection over the ocean, but the contrast in the visible was great enough to track the movement of the dust for several days off the African west coast. Measurements from the THIR 6.5-7.2 micron channel were useful for detecting the presence of cirrus clouds which could have caused a misinterpretation of the 10.5-12.5 micron TBB's. (Author)

**A75-16752 \*** Ice particulates in the mesosphere. E. T. Chesworth and L. C. Hale (Pennsylvania State University, University Park, Pa.). *Geophysical Research Letters*, vol. 1, Dec. 1974, p. 347-350. 14 refs. Grants No. NGR-39-009-218; No. DA-ARO(D)-31-124-72-G158.

The observations of noctilucent clouds, the measurements of hydrated and of large immobile ions, and the light-scattering layer detected by the OGO-6 satellite suggest the presence of particulates, probably ice, in the mesosphere. The correlation between temperature and positive ion conductivity where the vapor pressure over ice becomes greater than atmospheric pressure in the stratopause region indicates the presence of ice crystals throughout the mesosphere over a wide range of latitudes during all seasons. Between one and ten billion ice crystals per cubic meter of order 10 nanometers in diameter can dominate ionization loss processes in the mesosphere, and can explain a variety of experimental observations, including observed solar angle dependence and seasonal variability of electron density. (Author)

**A75-17102 #** Some features of the urban environment of Tokyo by remote sensing. I. Tsuchiya (Meteorological Research Institute, Tokyo, Japan). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 3-12. 5 refs.

Observations of surface temperature of the urban area of Tokyo were performed making use of several airborne remote sensing

methods on bright sunny afternoons during summer. The surface temperature of a river with a vast amount of water has the lowest temperature, natural or near natural forests have the next lowest temperature, an urban area with many highways is hotter than a suburban area with greenery, and a main street with heavy traffic is the hottest. There are many cases requiring +5 to +10 C corrections to the airborne records on heated roads and buildings. Urban air circulation assumes very complicated regime due to compounded heated and cooled areas of various scale under the developed thermal inversion during the sunshiny days in summer. Such circulation causes a very complicated flow of polluted air resulting in several densely polluted spots in the suburban area. (Author)

**A75-17105 \* #** Environmental studies of Iceland with ERTS-1 imagery. R. S. Williams, Jr. (U.S. Geological Survey, EROS Program Office, Reston, Va.), A. Boovarsson (Icelandic Surveying Department, Reykjavik, Iceland), S. Friiriksson, I. Thorsteinsson (Agricultural Research Institute, Reykjavik, Iceland), G. Palmason, S. Rist, K. Saemundsson (National Energy Authority, Iceland), H. Sigtryggsson (Icelandic Meteorological Service, Reykjavik, Iceland), and S. Thorarinnsson (University of Iceland, Reykjavik, Iceland). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 31-81. 104 refs. Research supported by the U.S. Geological Survey. NASA Order S-70243-G.

Imagery from the ERTS-1 satellite can be used to study geological and geophysical phenomena which are important in relation to Iceland's natural resources. Multispectral scanner (MSS) imagery can be used to map areas of altered ground, intense thermal emission, fallout from volcanic eruptions, lava flows, volcanic geomorphology, erosion or build-up of land, snow cover, the areal extent of glaciers and ice caps, etc. At least five distinct vegetation types and barren areas can be mapped using MSS false-color composites. Stereoscopic coverage of Iceland by side-lapping ERTS imagery permits precise analysis of various natural phenomena. A.T.S.

**A75-17112 \* #** A remote sensing study of Pacific hurricane Ava. D. Ross, J. McFadden (NOAA, Miami, Fla.), B. Au (U.S. Navy, Naval Research Laboratory, Washington, D.C.), and W. Brown (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 163-180. 13 refs.

Aircraft, Skylab, NOAA-2, ATS-3, and NIMBUS-5 recently obtained a variety of measurements of Pacific hurricane Ava. These measurements are unusually broad in scope and include satellite observed passive microwave emissivities at 13.9 and 19.5 GHz, active microwave scattering cross-sections at 13.9 GHz, and near infrared and visible images. Essentially simultaneous aircraft measurements of wind speed, waves, whitecaps, 1.4 and 13-15 GHz passive microwave emissivities, 1.4 GHz active microwave images, sea surface temperatures, pressure fields, and aerosol size distributions were also obtained. A brief description of sensors and platforms is presented along with some in-depth details of results obtained. (Author)

**A75-17114 \* #** Simultaneous active and passive microwave response of the earth - The Skylab radscat experiment. R. K. Moore, J. P. Claassen, A. C. Cook, D. L. Fayman, J. C. Holtzman, A. Sobti, F. T. Ulaby, J. D. Young (Kansas, University, Lawrence, Kan.), N. M. Hatcher (NASA, Johnson Space Center, Houston, Tex.), and W. E. Spencer. In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 189-217. 22 refs.

## 02 ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

The Skylab microwave radiometer-scatterometer experiment S-193 was designed to collect simultaneous information on the radiometric emission and the backscatter from the earth from orbital altitude for the first time. A primary driving force was ascertaining the response from the oceans of both active and passive systems to variations in wind, and the ability of the passive system to aid in calibrating the active system. Numerous overland applications were also explored. Preliminary results of backscatter and emission from sea and atmosphere are shown for hurricane Ava and for two flights across the Gulf of Mexico. The results tend to confirm the most recent theoretical prediction of an approximately square-law relation between scattering coefficient for horizontal polarization and wind-speed, with a somewhat smaller dependence for vertical polarization. Overland measurements show that scatterometer signals at 30 deg increase and radiometer signals decrease for terrain that has recently experienced rainfall. (Author)

**A75-17129 #** On the detectability of atmospheric carbon monoxide by microwave remote sensing. J. Fulde and E. Schanda (Bern, Universität, Berne, Switzerland). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 465-469. 5 refs.

The feasibility of tracing stratospheric and mesospheric carbon monoxide by microwave radiometric sensing of its 115-GHz line of the J sub 0-1 transition has been studied. A carefully designed balloon or airborne radiometer at 15 km altitude should be able to detect the excess temperature of 0.3 K due to CO at a zenith angle of 87 deg. (Author)

**A75-17130 \* #** Determination of the aerosol content in the atmosphere from ERTS-1 data. M. Griggs (Science Applications, Inc., La Jolla, Calif.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 471-481. 22 refs. Contract No. NAS5-21860.

The ERTS-1 satellite offered the opportunity of determining the feasibility of monitoring the atmospheric aerosol optical thickness on a global basis, as suggested by theoretical studies, which showed relationships between the upwelling earth-atmosphere radiance and the aerosol optical thickness, and between contrast and the aerosol optical thickness. These relationships were investigated at two test sites, using the multispectral scanner (MSS) radiance data, with ground-truth observations of the aerosol optical thickness being made with a Volz photometer at the time of the satellite overpasses. The results indicate that the MSS channels, 4, 5, and 6, centered at 0.55, 0.65, and 0.75 micron have comparable sensitivity, and that the optical thickness can be determined to within plus or minus 10% with the assumed measurement errors of the MSS. (Author)

**A75-17131 \* #** The effect of atmospheric water vapor on automatic classification of ERTS data. D. E. Pitts, W. E. McAllum (NASA, Johnson Space Center, Houston, Tex.), and A. E. Dillinger (Lockheed Electronics Co., Inc., Houston, Tex.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 483-497. 9 refs.

Absorption by atmospheric water vapor changes the spectral signatures collected by multispectral scanners if channels are not chosen to avoid the atmospheric water bands. For ERTS (Earth Resources Technology Satellite), the Multispectral Scanner band 7 (MSS 7, .8 to 1.1 micron) is the only band significantly affected. Line-by-line atmospheric absorption calculations showed that this

effect can multiply the intensity by factors ranging from .77 to 1.0. If horizontal gradients in atmospheric water exist between training fields and the rest of the scene, errors are introduced in automatic classification of the imagery. The degradation of the classification of corn and soybeans was determined by using actual ERTS data and simulating the absorption effects on the MSS 7 band. (Author)

**A75-17133 #** Design concepts for land use and natural resource inventories and information systems. R. L. Shelton (Michigan State University, Ann Arbor, Mich.) and E. E. Hardy (Cornell University, Ithaca, N.Y.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 517-535. 5 refs.

**A75-17136 #** Some findings on the applications of ERTS and Skylab imagery for metropolitan land use analysis. V. A. Milazzo (U.S. Geological Survey, Reston, Va.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 569-585. 8 refs.

Work undertaken on a three-sensor land use data evaluation for a portion of the Phoenix area is reported. Analyses between land use data generated from 1970 high-altitude photography and that detectable from ERTS and Skylab, especially in terms of changes in land use indicate that ERTS and Skylab imagery can be used effectively to detect and identify areas of post-1970 land use change, especially those documenting urban expansion at the rural-urban fringe. Significant preliminary findings on the utility of ERTS and Skylab data for metropolitan land use analysis, substantiated by evaluations with 1970 and 1972 ground control land use data are reported. (Author)

**A75-17137 \* #** Land type analysis for regional land use planning from photomorphologic mapping - An example for Boulder County, Colorado. J. E. Nichol (Aston, University, Birmingham, England). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 589-596. 8 refs. Research supported by the Boulder Area Growth Study Commission and Boulder County Department of Planning; Grant No. NGL-06-003-200.

**A75-17149 #** Interactive machine assessment of critical land resources using ERTS-1 data. W. W. Kuhlow and L. T. Fisher (Wisconsin, University, Madison, Wis.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 759-769. NSF-supported research.

The University of Wisconsin's Space Science and Engineering Center is currently developing a highly interactive man-machine system called McIDAS (Man-Computer Interactive Data Access System) created primarily for quick access to large volumes of digital data generated by satellites such as ATS-III, SMS and ERTS-1. The system is presently operable and several research projects are being carried out as further system developments proceed. This paper will describe the McIDAS system and some of its features which allow superior man-machine interaction. Impressions and results of investigators experienced in conventional remote sensing data analysis but completely unfamiliar with this system or other digital systems are presented. (Author)

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**A75-17153 \* #** Implementation of an advanced table look-up classifier for large area land-use classification. C. Jones (NASA, Johnson Space Center, Earth Resources Laboratory, Bay St. Louis, Miss.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 813-824. 6 refs.

Software employing Eppler's improved table look-up approach to pattern recognition has been developed, and results from this software are presented. The look-up table for each class is a computer representation of a hyperellipsoid in four dimensional space. During implementation of the software Eppler's look-up procedure was modified to include multiple ranges in order to accommodate hollow regions in the ellipsoids. In a typical ERTS classification run less than 6000 36-bit computer words were required to store tables for 24 classes. Classification results from the improved table look-up are identical with those produced by the conventional method, i.e., by calculation of the maximum likelihood decision rule at the moment of classification. With the new look-up approach an entire ERTS MSS frame can be classified into 24 classes in 1.3 hours, compared to 22.5 hours required by the conventional method. The new software is coded completely in FORTRAN to facilitate transfer to other digital computers. (Author)

**A75-17157 \* #** Effect of atmospheric haze and sun angle on automatic classification of ERTS-1 data. J. Potter and M. Shelton (Lockheed Electronics Co., Inc., Houston, Tex.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 865-874. 7 refs. Contract No. NAS9-12200.

The effect of variations in sun angle and haze level on the accuracy of automatic classification of Earth Resources Technology Satellite-1 (ERTS-1) data was studied by classifying ERTS imagery in which such variations were computer-simulated. It was found that relatively small changes in sun angle and haze level can substantially reduce classification accuracy. (Author)

**A75-17162 \* #** Scanning thermal plumes. F. L. Scarpace, R. P. Madding, and T. Green, III (Wisconsin, University, Madison, Wis.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 939-961. Research supported by the Wisconsin Department of Natural Resources, Wisconsin Power and Light Co., Wisconsin Public Service Corp., Wisconsin Electric Power Co., U.S. Department of Commerce, and NASA.

In order to study the behavior and effects of thermal plumes associated with the condenser cooling of power plants, thermal line scans are periodically made from aircraft over all power plants along the Wisconsin shore of Lake Michigan. Simultaneous ground truth is also gathered with a radiometer. Some sequential imagery has been obtained for periods up to two hours to study short term variations in the surface temperature of the plume. The article concentrates on the techniques used to analyze thermal scanner data for a single power plant which was studied intensively. The calibration methods, temperature dependence of the thermal scanner, and calculation of the modulation transfer function for the scanner are treated. It is concluded that obtaining quantitative surface-temperature data from thermal scanning is a nontrivial task. Accuracies up to plus or minus 0.1 C are attainable. A.T.S.

**A75-17165 #** Correlation of multispectral imagery with water analysis - The Ross Barnett Reservoir Remote Sensing Project. D. L. Wertz, W. T. Meador, M. L. Steele, and J. W. Pinson (Southern Mississippi, University, Hattiesburg, Miss.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 995-999.

**A75-17182 \* #** Boundaries of ERTS and aircraft data within which useful water quality information can be obtained. W. G. Egan (Grumman Aerospace Corp., Bethpage, N.Y.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1319-1343. 5 refs. NASA-sponsored research.

Calibration procedures have been devised and applied to ERTS-1, multispectral, true color, and false color imagery. The results indicate that the ERTS and multispectral imagery are correlated with optical in situ measurements of the harbor water. Correlation is extended to true and false color imagery through in situ optical measurements of the harbor water. The best photometric accuracy is achieved with multispectral aerial imagery and the use of bulk MSS tape. The aircraft green photographic and ERTS-1 MSS-4 bands have been found most suitable for monitoring the scattered light levels under the conditions of this investigation. The application of satellite or aircraft for optical remote sensing depends upon the physical scale and frequency of sensing since both sensor systems generally have sufficient photometric sensitivity. The chemical parameters of the harbor water were found to be correlated to the optical properties for two stations investigated in detail. (Author)

**A75-17188 \* #** Land use classification and ground truth correlations from simultaneously acquired aircraft and ERTS-1 MSS data. A. J. Richardson, M. R. Gautreaux, R. J. Torline, and C. L. Wiegand (U.S. Department of Agriculture, Weslaco, Tex.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1423-1440. 12 refs. NASA Order S-70251-AG.

**A75-17204 #** The calculation of cloud shadows in modelling of the earth's surface survey from space. B. V. Vinogradov (Akademii Nauk SSSR, Institut Geografii, Moscow, USSR) and A. B. Vinogradov (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1679-1684.

An analytical formula is developed which describes the relationships between the sporadic cumulus coverage, the sun height, and the additional coverage of the earth's surface by cloud shadows. Based on this formula, the sun height of about 40 to 45 deg is optimized for natural resources survey from satellites synchronous with the sun. (Author)

**A75-17205 \* #** Remote measurements of water pollution with a lidar polarimeter. T. C. Sheives, J. W. Rouse, Jr., and W. T. Mayo, Jr. (Texas A & M University, College Station, Tex.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1695-1708. 7 refs. U.S. Department of Transportation Contract No. CG-34071-A; Grant No. NGL-44-001-001.

This paper examines a dual polarization laser backscatter system as a method for remote measurements of certain water quality parameters. Analytical models for describing the backscatter from turbid water and oil on turbid water are presented and compared with experimental data. Laser backscatter field measurements from natural waterways are presented and compared with simultaneous ground observations of the water quality parameters: turbidity, suspended solids, and transmittance. The results of this study show that the analytical models appear valid and that the sensor investigated is applicable to remote measurements of these water quality parameters and oil spills on water. (Author)



**A75-17234 \*** # **Multidisciplinary applications of ERTS and Skylab data in Ohio.** D. C. Sweet, P. G. Pincura (Department of Economic and Community Development, Columbus, Ohio), C. J. Meier (Department of Natural Resources, Columbus, Ohio), G. B. Garrett (Ohio Environmental Protection Agency, Columbus, Ohio), L. O. Herd (U.S. Department of Transportation, Washington, D.C.), J. M. Dowdy (Ohio State University, Columbus, Ohio), D. M. Anderson (Ohio Biological Survey, Columbus, Ohio), G. E. Wukelic, J. G. Stephan, and H. E. Smail (Battelle Columbus Laboratories, Columbus, Ohio). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings, Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 2093-2106. 8 refs. NASA-supported research.

Experimental studies of ERTS-1 and Skylab earth resources data, in combination with correlative aircraft and on-site data, for environmental quality, land use, and resource management applications in Ohio show several areas of operational promise. Prime data use candidates demonstrated to date include definition and enforcement of surface mining (all minerals) legislation; Lake Erie modeling/management; land use classification and mapping studies at state, regional, and localized levels; and resources' inventories particularly of forested areas on both regional (multicounty) and localized scales. (Author)

**A75-17667** **Investigations of diffuse cosmic gamma radiation in the range 28 keV-4.1 MeV.** E. P. Mazets, S. V. Golenetskii, V. N. Il'inskii, Iu. A. Gur'ian, and T. V. Kharitonova (Akademiia Nauk SSSR, Fiziko-Tekhnicheskii Institut, Leningrad, USSR). (*ZHETF Pis'ma v Redaktsiiu*, vol. 20, July 20, 1974, p. 77-80.) *JETP Letters*, vol. 20, July 20, 1974, p. 32-34. 14 refs. Translation.

The Kosmos-461 satellite carried experiments to study the diffuse background of X rays and gamma rays in the range 28 keV-4.1 MeV. The procedures developed for eliminating the influence of atmospheric radiation and of radioactivity induced in the detector by cosmic rays are described. It is concluded that the diffuse background can not be represented by a single law in the range investigated. Measurements by Apollo 15 and high-altitude balloons are judged to overestimate the gamma-ray flux in the 10-30 MeV range. A.T.S.

**A75-17932 #** **The potentialities for determining content of minor gas constituents in the atmosphere by satellites (O vozmozhnostiakh opredeleniia soderzhaniia mal'kikh gazovykh komponentov atmosfery so sputnikov).** V. V. Rozanov and Iu. M. Timofeev (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Meteorologiya i Gidrologiya*, Nov. 1974, p. 87-91. 23 refs. In Russian.

The use of oblique measurements of atmospheric transmittance as a base for determinations of the concentrations of minor gas constituents (CO, CH<sub>4</sub>, NO, N<sub>2</sub>O, NH<sub>3</sub>, etc.) in the atmosphere is briefly discussed. A simple, approximate formula, not requiring any knowledge of the fine structure of absorption bands, is given for computing vertical profiles of gas concentrations from transmittance data. P.T.H.

**A75-18054** **Recent progress in urban mapping.** J. P. Burns (U.S. Geological Survey, National Center, Reston, Va.). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1974, p. 45-49.

Accurate large-scale maps of urban areas are urgently needed. They are the first step in a logical solution to severe socioeconomic problems caused by population explosion in these regions. Fragmented urban governmental structure makes urban mapping uncoordinated, repetitive and wasteful unless it is undertaken by a centrally-coordinated Federal effort. Several pilot projects have provided knowledge of specific urban map needs on which a national map series can be based. An early 1973 program decided upon a 1:2400 scale in order to reach a broad user cross-section and orthophoto mapping for detail and ease in updating. At Fort Wayne,

Ind., 440 half-square-mile orthophoto map bases were produced, and the Schut method was applied in aerotriangulation. USGS-monitored non-federal projects are also under way. S.J.M.

**A75-18057** **Remote sensing and land use inventory and mapping.** J. R. Anderson (U.S. Geological Survey, Reston, Va.). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1974, p. 66-71. 7 refs.

In the Geography Program of the U.S. Geological Survey, we have been working experimentally for more than two years to develop a program which will provide needed data on current land use efficiently and in a timely way. A two-level resource-oriented land use classification system for use with remote sensor data has been developed. This system can be expanded by State, local governments, or by Federal agencies to the third and fourth levels for greater detail. The classification system and new methods of collecting current land use data using remote sensor source data have been successfully tested. (Author)

**A75-18058** **The application of ERTS-derived information to the regional land use planning process.** J. L. Clapp, R. W. Kiefer, W. W. Kuhlou, and B. J. Niemann, Jr. (Wisconsin, University, Madison, Wis.). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1974, p. 72-87.

The need for the development and implementation of methods for the detection, inventory and monitoring of land resource variables is reflected in present and pending federal and state legislation. Data has been extracted from ERTS imagery, RB-57 color infrared imagery and best available conventional sources for a 10,000 square kilometer test area in eastern Wisconsin. The data is compared on a spatial basis for a 300 square kilometer portion of the test area and the effect of the data source on land use decisions is examined. Based upon these investigations it is concluded that ERTS can provide an operational data source for land use planning at the policy level. (Author)

**A75-18059 \*** **Land use classification with ERTS-1 data in the Houston area test site.** J. E. Dornbach (NASA, Johnson Space Center, Houston, Tex.). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1974, p. 88-98.

**A75-18061** **Remote sensing for regional resource analysis.** O. W. Mintzer and J. M. Dowdy (Ohio State University, Columbus, Ohio). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1974, p. 137-154. 12 refs.

In improving levels of living, we become increasingly involved in activities which provide additional economic growth. These activities include the development of natural resources to make them more accessible for productive and beneficial uses. In order to accomplish these goals we are turning to remote sensing technology which is useful for many data acquisition tasks. The technique of using ERTS imagery, airphotos and mini-format aerial color photography is demonstrated as the synergistic remote sensing approach for inventories of regional resources. (Author)

**A75-18064** **The application of ERTS-1 data to the Corps of Engineers Civil Works Mission.** S. C. Sollers (U.S. Army, Office of the Chief of Engineers, Washington, D.C.). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Church, Va., American Society of Photogrammetry, 1974, p. 181-203.

## 02 ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

In support of its civil works function, the Army Corps of Engineers is constantly engaged in applied research to observe natural processes and ecological relationships in the interest of preservation of natural resources. Remotely sensed data facilitates this research. The application of remotely sensed imagery results in the saving of time and money and increased precision in gross evaluation of large ecosystems and provides a convenient method to monitor changes within such a system. Several projects are now underway employing remotely sensed data acquired from the NASA Earth Resources Technology Satellite (ERTS-1). (Author)

**A75-18069** Application of ERTS data to environmental inventory and assessment. J. D. O'Neal and J. R. Burns (U.S. Army, Engineer Topographic Laboratories, Fort Belvoir, Va.). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1974, p. 256-261.

The use of ERTS imagery to supplement aerial photography and collateral source material has expedited the preparation of land use and vegetative cover maps included in environmental resources inventory studies. The studies are being prepared by the Engineer Agency for Resources Inventories (EARI), an element of the U.S. Army Engineer Topographic Laboratories, to satisfy civil works program requirements of Corps of Engineers division and district offices for basic input for project planning and preparation of environmental impact statements. The paper describes recent experience gained by EARI in support of programs of district offices of the Lower Mississippi Valley Division and the Ohio River Division of the Corps. (Author)

**A75-18070** Land use mapping using ERTS-1 imagery for The Rivers Resource Conservation and Development District in Kansas. R. V. Shaklee and T. L. Talmon (Kansas, University, Lawrence, Kan.). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1974, p. 262-267.

**A75-18108** # New methods for studying the dynamics of the entire earth. E. Tengstrom (Uppsala, Universitet, Uppsala, Sweden). In: Geodesy and physics of the earth; Proceedings of the Second International Symposium, Potsdam, East Germany, May 7-11, 1973. Part 1. Potsdam, East Germany, Deutsche Akademie der Wissenschaften, Zentralinstitut für Physik der Erde, 1974, p. 39-46.

Methods involving new theoretical procedures including the collaboration of scientists in geodesy, geophysics, and astronomy in a unified approach are required to study geodynamical problems related to a deformable earth with elastoviscous properties and discontinuities of density, elasticity, and plasticity. Attention is given to astrogeodetic measurements, gravity field measurements, earth tide records, and aspects of very-long base-line interferometry. G.R.

**A75-18151** Conference on Weather Forecasting and Analysis, 5th, St. Louis, Mo., March 4-7, 1974, Preprints. Conference sponsored by the American Meteorological Society. Boston, American Meteorological Society, 1974. 301 p. Members, \$15.; nonmembers, \$20.

Topics discussed include automated weather systems of the future; the formulation, expression, dissemination, and use of weather forecasts; the use of satellite data in weather forecasting; observations of precipitation and clouds; mesoscale and synoptic-scale forecasting and analysis; air pollution and urban effects; applications and deficiencies of synoptic meteorological material; ceiling and visibility forecasting; planetary boundary layer phenomena; and convective activity.

A.B.K.

**A75-18153** # Observing and forecasting local effects from satellite data. F. C. Parmenter (NOAA, National Environmental Satellite Service, Washington, D.C.). In: Conference on Weather Forecasting and Analysis, 5th, St. Louis, Mo., March 4-7, 1974, Preprints. Boston, American Meteorological Society, 1974, p. 46-49.

Many mesoscale cloud patterns are strongly influenced by terrain, geography and urbanization. Continuous satellite data over the U.S. have allowed meteorologists to observe the establishment and dissipation of many small-scale cloud formations due to local effects heretofore known mainly to residents of the locale. The distribution of cloudiness to the lee of the Great Lakes, along the East Coast, and over the mountainous states is discussed. (Author)

**A75-19457** \* A Shuttle/SpaceLab RF environment survey facility. R. E. Taylor (NASA, Goddard Space Flight Center, Greenbelt, Md.), R. E. Prince, and D. N. McGregor (Operations Research, Inc., Silver Spring, Md.). In: National Telecommunications Conference, San Diego, Calif., December 2-4, 1974, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 318-326.

This paper describes some of the basic system considerations of a proposed experiment for monitoring and measuring the global electromagnetic radiation environment. RF spectrum coverage for this spaceborne survey facility is anticipated to be quite broad and will include selected frequency bands ranging from UHF to millimeter waves. By establishing this RF environment survey facility, a broad data base of useful electromagnetic field intensity information will be developed. This, in turn, should help both the regulatory agencies and user community in terms of future frequency planning and system design by avoiding unwarranted interference. It is proposed that this experiment be flown as a future test bed during the Shuttle/Spacelab era for continuously gathering and updating information on earth-emitted electromagnetic emissions on a global scale. (Author)

**N75-10469** # Sandia Corp., Albuquerque, N.Mex. MODERN TRENDS IN ENVIRONMENTAL TESTING A. J. Clark, Jr. 1 Feb. 1974 16 p refs Presented at the 20th Ann. Tech. Meeting and Equipment Exposition of the Inst. of Environ. Sci., Washington, D. C., 28 Apr. 1974 Sponsored by AEC (SLA-73-5931; Conf-740415-1) Avail: NTIS HC \$3.25

From 20th annual technical meeting and equipment exposition of the Institute of Environmental Sciences; Washington, District of Columbia, U.S.A. (28 Apr. 1974). NSA

**N75-10535** \* Boeing Co., Kent, Wash. QUANTITATIVE DETERMINATION OF STRATOSPHERIC AEROSOL CHARACTERISTICS Monthly Report, Sep. 1974 David L. Tingey, Principal Investigator Sep. 1974 1 p EREP (Contract NAS9-13303) (E74-10808; NASA-CR-140502) Avail: NTIS HC \$3.25 CSCL 04A

**N75-10538** \* Tennessee Univ., Knoxville. Dept. of Electrical Engineering. ERTS-1 IMAGERY INTERPRETATION TECHNIQUES IN THE TENNESSEE VALLEY Final Report, Sep. 1972 - Mar. 1974 Robert E. Bodenheimer, Principal Investigator Apr. 1974 59 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS (Contract NAS5-21875) (E74-10811; NASA-CR-140505; TR-EE/CS-74-5) Avail: NTIS HC \$4.25 CSCL 08B

The author has identified the following significant results. The feasibility of delineating major soil associations and land

uses through computerized analyses is discussed. Useful and potential applications in detecting landscape change and land use mapping are described. Recommendations for improving the data processing effort in a multidisciplinary program are presented.

**N75-10545\*#** Dartmouth Coll., Hanover, N.H. Dept. of Geography.

**INVESTIGATION OF LAND USE OF NORTHERN MEGALOPOLIS USING ERTS-1 IMAGERY** Final Report, Jun. 1972 - Jul. 1973

Robert B. Simpson, David T. Lindgren, David J. Ruml, and William Goldstein Washington NASA Sep. 1974 63 p refs Original contains color illustrations

(Contract NAS5-21749)

(NASA-CR-2459; S13-116) Avail: NTIS HC \$4.25 CSCL 08B

Primary objective was to produce a color-coded land use map and digital data base for the northern third of Megalopolis. Secondary objective was to investigate possible applications of ERTS products to land use planning. Many of the materials in this report already have received national dissemination as a result of unexpected interest in land use surveys from ERTS. Of special historical interest is the first comprehensive urban-type land use map from space imagery, which covered the entire state of Rhode Island and was made from a single image taken on 28 July 1972.

Author

**N75-10551\*** Alaska Univ., Fairbanks.

**ENVIRONMENTAL SURVEYS IN ALASKA BASED UPON ERTS DATA**

John M. Miller In NASA. Goddard Space Flight Center Third ERTS Symp., Vol. 2 May 1974 p 12-40

CSCL 08B

Alaskan applications of ERTS data are summarized. Areas discussed are: (1) land use; (2) archaeology; (3) vegetation mapping; (4) ice reporting and mapping; (5) permafrost; (6) mineral and oil exploration; (7) geological surveys; (8) seismology; (9) geological faults and structures; (10) hydrology and water resources; (11) glaciology; (12) water circulation in Cook Inlet; and (13) fish and mammal populations.

A.L.

**N75-10560\*** National Aeronautics and Space Administration. Mississippi Test Facility, Bay Saint Louis.

**LAND USE AND MAPPING**

Armond T. Joyce In its Third ERTS Symp., Vol. 2 May 1974 p 138-146

CSCL 08B

The ERTS program provides data that can be used to derive information relative to the actual use of the land resource, in a practical and timely manner. ERTS data provide coverage of total land areas, and its repetitive nature enables the detection and monitoring of changes taking place in land use. Generally, the techniques and the procedures used to extract information from ERTS data may be categorized as pertaining to either the interpretations of ERTS imagery or to the use of digital data and computer techniques. Examples are given of the use of ERTS-1 data for land use classification in: (1) New England areas; (2) Chesapeake Bay and Washington, D.C.; (3) Mississippi Gulf Coast; (4) Los Angeles, California; (5) Houston, Texas; and (6) Phoenix, Arizona.

Author

**N75-10563\*#** Texas A&M Univ., College Station. Remote Sensing Center.

**A STUDY OF A DUAL POLARIZATION LASER BACKSCATTER SYSTEM FOR REMOTE IDENTIFICATION AND MEASUREMENT OF WATER POLLUTION**

Thomas Carlyle Sheives May 1974 148 p refs

(Grant NGL-44-001-001; Contract DOT-CG-34017-A)

(NASA-CR-140665; RSC-53) Avail: NTIS HC \$5.75 CSCL 171

Remote identification and measurement of subsurface water turbidity and oil on water was accomplished with analytical models which describe the backscatter from smooth surface turbid water, including single scatter and multiple scatter effects. Lidar measurements from natural waterways are also presented and compared with ground observations of several physical water quality parameters.

Author

**N75-10572\*#** Miami Univ., Coral Gables, Fla. Clean Energy Research Inst.

**APPLICATION OF REMOTE SENSING FOR PREDICTION AND DETECTION OF THERMAL POLLUTION**

T. Nejat Veziroglu and Samuel S. Lee Oct. 1974 100 p refs (Contract NAS10-8498)

(NASA-CR-139182) Avail: NTIS HC \$4.75 CSCL 13B

The first phase is described of a three year project for the development of a mathematical model for predicting thermal pollution by use of remote sensing measurements. A rigid-lid model was developed, and results were obtained for different wind conditions at Biscayne Bay in South Florida. The design of the measurement system was completed, and instruments needed for the first stage of experiment were acquired, tested, and calibrated. A preliminary research flight was conducted.

Author

**N75-10638#** California Univ., Livermore. Lawrence Livermore Lab.

**COMPARISON OF THE SOUTHERN AND NORTHERN HEMISPHERE GENERAL CIRCULATION CHARACTERISTICS AS DETERMINED BY SATELLITE OZONE DATA**

J. E. Lovill Mar. 1974 51 p refs Presented at the 1st Spec. Assembly of the Intern. Assoc. of Meteorol. and Atmospheric Phys., Melbourne, 14-25 Jan. 1974 Sponsored by AEC (UCRL-75556; Conf-740106-4) Avail: NTIS HC \$4.25

Satellite total ozone data were analyzed for the Southern Hemisphere (autumn and winter) and the Northern Hemisphere (spring and summer). A strong correlation was found between global meridional gradients of total ozone and the wind velocity in baroclinic zones. The ozone wave maxima correspond to regions of stratospheric heating. A large region of low total ozone was observed in the four months averages in equatorial regions, extending from Southeast Asia to the central Pacific; a large area of high equatorial ozone occurs from the central Atlantic across Africa. This ozone distribution suggests a large double cell motion near the equator, such that there is a large scale descending motion in the Atlantic and African sectors, as well as a slowly ascending motion in the Southeast Asian and Pacific sectors. A relatively tight ozone gradient was also seen in the Atlantic Ocean between 40 deg N and 50 deg N, a region which corresponds to the high density aircraft flight corridor between the eastern United States and the European region.

Author

**N75-11413\*#** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**EXPLORATION FOR FOSSIL AND NUCLEAR FUELS FROM ORBITAL ALTITUDES**

Nicholas M. Short Nov. 1974 59 p

(NASA-TM-X-70781; X-923-74-322) Avail: NTIS HC \$4.25 CSCL 08G

Results from the ERTS program pertinent to exploration for oil, gas, and uranium are discussed. A review of achievements in relevant geological studies from ERTS, and a survey of accomplishments oriented towards exploration for energy sources are presented along with an evaluation of the prospects and limitations of the space platform approach to fuel exploration, and an examination of continuing programs designed to prove out the use of ERTS and other space system in exploring for fuel resources.

Author

## 02. ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

**N75-11476#** World Meteorological Organization, Geneva (Switzerland).

### **OBSERVATION AND MEASUREMENT OF ATMOSPHERIC POLLUTION**

1974 675 p. refs. Partly in ENGLISH, FRENCH and SPANISH. Proc. of the TECOMAP Conf., Helsinki, 30 Jul. - 4 Aug. 1973; sponsored in part by the World Health Organ. (WMO-368; Rept-3; ISBN-92-63-10368-2) Avail: NTIS HC \$15.25

Papers are presented on: requirements for measurement of air pollutants for forecasting of pollution potential; measurement and analysis of pollutants on urban, regional, and global scales; turbidity and radiation measurement as indicators of pollution; and method of standardization and intercomparison.

**N75-11498** World Meteorological Organization, Geneva (Switzerland).

### **A TECHNIQUE FOR MEASUREMENT OF SULPHUR DIOXIDE AND SULPHATE CONCENTRATIONS FROM AN AIRCRAFT**

D. A. Johnson and D. H. F. Atkins. *In its* Observation and Meas. of Atmospheric Pollution 1974 p 216-222 refs

An airborne air sampling is described which, using a dry filtration technique, enables sulfur dioxide and sulfate concentration to be determined over distances of 40 km or more. ESRO

**N75-11505** World Meteorological Organization, Geneva (Switzerland).

### **CORRELATION SPECTROSCOPY TECHNIQUES FOR THE REGIONAL AND GLOBAL MEASUREMENTS OF AIR POLLUTION**

J. H. Davies. *In its* Observation and Meas. of Atmospheric Pollution 1974 p 282-296 refs

The remote sensing approach to air quality monitoring is reviewed, and optical correlation techniques applied to remote sensing of gaseous atmospheric constituents are discussed. Correlation spectroscopy is described, and results of studies using the method for aircraft and balloon measurements of sulfur and nitrogen dioxide are presented. The application of airborne and satellite mounted remote sensors to atmospheric monitoring is also discussed. ESRO

**N75-11510** World Meteorological Organization, Geneva (Switzerland).

### **GEOPHYSICAL MONITORING FOR CLIMATIC CHANGE. THE NOAA PROGRAM**

D. H. Pack, R. Fegley, G. Herbert, D. Hoyt, W. Komhyr, J. Miller, and C. Turner. *In its* Observation and Meas. of Atmospheric Pollution 1974 p 334-345 refs

The overall objective of the NOAA's program is to predict the effects of natural or artificial emissions into the atmosphere on climate. The processes by which the monitoring program was designed, locations for additional observations selected, the rationale for the primary measurement program and a brief discussion of the instrumentation, the quality control and data aspects required for the program are outlined. ESRO

**N75-11521\*** World Meteorological Organization, Geneva (Switzerland).

### **GLOBAL MEASUREMENTS OF AIR POLLUTION FROM SATELLITES**

L. L. Acton, E. R. Bartle, M. Griggs, G. D. Hall, W. D. Hesketh, C. B. Ludwig, W. Malkmus, and H. Reichle. *In its* Observation and Meas. of Atmospheric Pollution 1974 p 434-442 refs

(Contract NAS1-12048)

The conceptual design of an FOV nadir radiometer was examined for its applicability to monitoring the radiation process in the atmosphere as it relates to aerosol behavior. The instrument employs a gas filter correlation technique and is suitable for transportation onboard satellite. ESRO

**N75-11523** World Meteorological Organization, Geneva (Switzerland).

### **MEASUREMENT OF TRACE STRATOSPHERIC GASES BY INVERTING THERMAL INFRARED LIMB RADIANCE PROFILES**

John C. Gille, James M. Russell, III, Paul L. Bailey, and Frederick B. House. *In its* Observation and Meas. of Atmospheric Pollution 1974 p 455-462 refs

An infrared technique for the remote measurement by satellite of minor constituents in the upper troposphere, stratosphere, and lower mesosphere is described. The spectral features used are explained, and the quality of results expected are discussed. A summary of expected capabilities from such an experiment is presented, with consideration of instrumentation requirements. ESRO

**N75-11527** World Meteorological Organization, Geneva (Switzerland).

### **GROUND-BASED MEASUREMENTS OF SOLAR RADIATION BY GEOPHYSICAL MONITORING FOR CLIMATIC CHANGE (USA)**

Douglas V. Hoyt and Gary A. Herbert. *In its* Observation and Meas. of Atmospheric Pollution 1974 p 506-515 refs (For

A progress report is presented on the geophysical monitoring for climatic change (GMCC) program which is to provide baseline observations of the incident solar radiation. The field and calibration instrumentation (multichannel pyroheliometers, pyranometers, and radiometers) are described in detail, and aspects of the data analysis are discussed. ESRO

**N75-11529\*** World Meteorological Organization, Geneva (Switzerland).

### **MICROWAVE ROTATIONAL SPECTROSCOPY: A PHYSICAL TECHNIQUE FOR SPECIFIC POLLUTANT MONITORING**

Lawrence W. Hrubesh. *In its* Observation and Meas. of Atmospheric Pollution 1974 p 526-537 refs

(NASA Order L-75902; Contracts EPA-IAG-D179(D))

Evidence is presented that microwave rotational spectroscopy can be developed for use in air pollution monitoring, with the employment of a diode-cavity spectrometer capable of detecting small concentrations of NO<sub>2</sub>, SO<sub>2</sub>, H<sub>2</sub>CO, and HN<sub>3</sub> gas with very high specificity. The theory behind the technique is discussed, together with its application and experimental results. ESRO

**N75-11531** World Meteorological Organization, Geneva (Switzerland).

### **MEASUREMENTS OF METEOROLOGICAL PARAMETERS AND AIR POLLUTION SPREAD OVER STOCKHOLM, SWEDEN, BY MEANS OF REMOTE SENSING AND AIRBORNE INSTRUMENTATION**

Lars E. Olsson, Christer Persson, Arne Haagaard, Hans Ottersten, Lennart Granat, and Claes Traegaardh. *In its* Observation and Meas. of Atmospheric Pollution 1974 p 545-556 refs Sponsored partly by the Swed. Environ. Protect. Board and the Swed. Board for Tech. Develop.

A comparison is made of different available measurement techniques suitable for studies of mesoscale air pollution dispersion over Stockholm, Sweden. The measurement program is outlined and the aircraft instrumentation briefly described. The results are presented and discussed. ESRO

**N75-11540** World Meteorological Organization, Geneva (Switzerland).

### **QUALITY CONTROL IN GLOBAL AND REGIONAL AIR CHEMISTRY MONITORING NETWORKS: LESSONS OF THE EUROPEAN AIR CHEMISTRY NETWORK**

M. P. Paterson and R. S. Scorer. *In its* Observation and Meas. of Atmospheric Pollution 1974 p 647-655 refs

A preliminary analysis was made of annual data on the Ca/Mg ratio from the continental area of the European Air

Chemistry Network. The results of this analysis are given and it is concluded that much of the data is wrong, due to faults in the chemical analysis. ESRO

**N75-11552\*** Tohoku Univ., Sendai (Japan).

**RADIATIVE TRANSFER OF VISIBLE RADIATION IN TURBID ATMOSPHERE**

Giichi Yamamoto and Masayuki Tanaka *In Calif. Univ. Proc. of the UCLA Intern. Conf. on Radiation and Remote Probing of the Atmosphere 1974 p 74-134 refs*

**CSSL 04A**

Methods are presented for solving radiative transfer problems; they include the doubling method and the closely related matrix method, iterative method, Chandrasekhar's method of discrete ordinates, and Monte Carlo method. To consider radiation transport through turbid atmosphere, an atmospheric model was developed characterizing aerosols by parameters. Intensity and polarization of radiation in turbid atmospheres is discussed, as well as lower atmospheric heating due to solar radiation absorption by aerosols. J.A.M.

**N75-11553\*** Mainz Univ. (West Germany).

**SCATTERING AND ABSORPTION FROM POLY-DISPERSED AEROSOLS**

K. Bullrich, R. Eiden, G. Eschelbach, K. Fischer, G. Haenel, and J. Heintzenberg *In Calif. Univ. Proc. of the UCLA Intern. Conf. on Radiation and Remote Probing of the Atmosphere 1974 p 135-161 refs*

**CSSL 04A**

Results from numerical computations of the diffuse sky radiances and degree of polarization are given. These results were obtained by solving the equation of radiative transfer in the formulation of Eschelbach. In these computations, multiple scattering and absorption by aerosol particles were considered. In addition, results from experimental measurements of the complex refractive index of aerosol samples at different relative humidities are presented. From the radiation flux divergences which were computed based on the determined properties of atmospheric aerosol particles, atmospheric heating rates were derived which were found to be comparable to the heating rates by water vapor. Author

**N75-11554\*** Leiden Univ. Observatory (Netherlands).

**MULTIPLE SCATTERING IN CLOUD LAYERS; SOME RESULTS**

H. C. VanDeHulst *In Calif. Univ. Proc. of the UCLA Intern. Conf. on Radiation and Remote Probing of the Atmosphere 1974 p 162-195 refs*

**CSSL 04A**

Theoretical methods are discussed for calculating radiative effects of aerosols. Experimental determination is emphasized for relevant aerosol parameters on a global basis to arrive at realistic estimates of heating and cooling. Internal radiation fields in very thin and very thick slabs are reviewed. Phase functions, polarization, emission by internal sources, and path length distribution are also considered. J.A.M.

**N75-11555\*** Ljubljana Univ. (Yugoslavia). Dept. of Physics.  
**SOME ANALYTICAL RESULTS FOR RADIATIVE TRANSFER IN THICK ATMOSPHERES**

I. Kuscer and N. J. McCormick *In Calif. Univ. Proc. of the UCLA Intern. Conf. on Radiation and Remote Probing of the Atmosphere 1974 p 196-226 refs* Sponsored in part by NSF

**CSSL 04A**

Singular eigenmode expansions are a convenient analytical tool with which to study problems of monochromatic radiative transfer in thick or semi-infinite atmospheres. Some closed-form solutions are presented for anisotropic scattering, with the neglect of polarization effects. A basic ingredient for applications to the semi-infinite medium is Chandrasekhar's H-function, which is best defined through the Wiener-Hopf factorization. The solutions of the Milne and albedo problems are discussed in order that the method of matched asymptotic approximations may be used to

describe the solution for a thick atmosphere adjacent to a diffusely reflecting ground. Expressions for the emerging distributions are quoted. A possible extension of the general scheme to problems involving polarization is indicated. Author

**N75-11556\*** California Univ., Los Angeles. Dept. of Physics.  
**LECTURES ON THE SCATTERING OF LIGHT**

David S. Saxon *In its Proc. of the UCLA Intern. Conf. on Radiation and Remote Probing of the Atmosphere 1974 p 227-308 refs*

**CSSL 04A**

The exact (Mie) theory for the scattering of a plane wave by a dielectric sphere is presented. Since this infinite series solution is computationally impractical for large spheres, another formulation is given in terms of an integral equation valid for a bounded, but otherwise general array of scatterers. This equation is applied to the scattering by a single sphere, and several methods are suggested for approximating the scattering cross section in closed form. A tensor scattering matrix is introduced, in terms of which some general scattering theorems are derived. The application of the formalism to multiple scattering is briefly considered. Author

**N75-11557\*** Leningrad (A. A. Zhdanov) State Univ. (USSR).  
**INFLUENCE OF THE ATMOSPHERE ON SPECTRAL RADIANCE AND CONTRASTS OF NATURAL FORMATIONS MEASURED FROM SPACE**

K. Ya. Kondratyev, A. A. Buznikov, O. B. Vasilyev, and O. I. Smokty *In Calif. Univ. Proc. of the UCLA Intern. Conf. on Radiation and Remote Probing of the Atmosphere 1974 p 309-336 refs*

**CSSL 04A**

The method of transfer functions is discussed that enable the elimination of atmospheric effects from spectral photometric data measured from spacecraft. Soyuz 7, 9 and Salyut spacecraft data were used. The results made it possible to estimate the variations in the transfer functions in the visible spectral region depending on the albedo of the underlying surface both for the uniform surfaces and near the boundary between two uniform underlying surfaces. J.A.M.

**N75-11558\*** California Univ., Los Angeles. Dept. of Meteorology.

**PARTICULATE SIZES FROM POLARIZATION MEASUREMENTS**

Jacob G. Kuriyan *In its Proc. of the UCLA Intern. Conf. on Radiation and Remote Probing of the Atmosphere 1974 p 337-366 refs* Sponsored in part by DOT and NASA

**CSSL 04A**

Radiation measurements from a ground based polarimeter were used to infer the optical properties of atmospheric particles. The inherent nonuniqueness in model calculations is discussed. The inverse problem in atmospheric optics is described, along with incident and emergent beams. Emergent radiation was calculated for all possible particulate distributions, and results were catalogued. J.A.M.

**N75-11559\*** Stanford Research Inst., Menlo Park, Calif. Atmospheric Sciences Lab.

**LIDAR OBSERVATIONS OF ATMOSPHERIC PARTICULATE CONTENT**

R. T. H. Collis, P. B. Russell, E. E. Uthe, and W. Viezee *In Calif. Univ. Proc. of the UCLA Intern. Conf. on Radiation and Remote Probing of the Atmosphere 1974 p 367-394 refs*

**CSSL 04A**

The role of lidar in atmospheric studies concerned with radiative energy transfer and remote sensing is summarized. The application of lidar to climatic change investigations is proposed. J.A.M.

**N75-11560\*** National Center for Atmospheric Research, Boulder, Colo.

**METHODS OF CALCULATING INFRARED TRANSFER: A REVIEW**

## 02 ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

John C. Gille / In Calif. Univ. Proc. of the UCLA Intern. Conf. on Radiation and Remote Probing of the Atmosphere 1974 p 395-430 refs Sponsored by NSF

### CSCL 04A

Methods for calculating the transfer of infrared radiation in planetary atmospheres are summarized. Direct spectral integration is compared with high precision measurements, suggesting that calculational techniques are sufficient for molecular atmospheres. Infrared transfer is used to study the atmospheric energy budget and atmospheric structures. J.A.M.

**N75-12391\*#** Environmental Research Inst. of Michigan, Ann Arbor.

**STUDY OF ATMOSPHERIC EFFECTS IN SKYLAB DATA Quarterly Progress Report, 1 Jun. - 31 Aug. 1974**

Frederick J. Thomson, Principal Investigator 6 Nov. 1974 3 p EREP

(Contract NAS9-13272)

(E75-10006; NASA-CR-140728; ERIM-101700-17-L; QPR-6) Avail: NTIS HC \$3.25 CSCL 05B

**N75-12393\*#** Boeing Co., Kent, Wash.

**QUANTITATIVE DETERMINATION OF STRATOSPHERIC AEROSOL CHARACTERISTICS Monthly Report, Oct. 1974**

David L. Tingey, Principal Investigator Oct. 1974 1 p EREP (Contract NAS9-13303)

(E75-10010; NASA-CR-140656) Avail: NTIS HC \$3.25 CSCL 04A

**N75-12397\*#** Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.

**EVALUATION OF SKYLAB IMAGERY AS AN INFORMATION SERVICE FOR INVESTIGATING LAND USE AND NATURAL RESOURCES Progress Report**

Ernest E. Hardy, Principal Investigator [1974] 18 p EREP

(Contract NAS9-13364)

(E75-10018; NASA-CR-140732) Avail: NTIS HC \$3.25 CSCL 05B

**N75-12398\*#** Geological Survey, Reston, Va.

**URBAN AND REGIONAL LAND USE ANALYSIS: CARETS AND CENSUS CITIES EXPERIMENT PACKAGE Monthly Progress Report, Jul. - Aug. 1974**

Robert Alexander, Principal Investigator and Harry F. Lins, Jr. 20 Aug. 1974 4 p EREP

(NASA Order T-5290-B)

(E75-10019; NASA-CR-140733) Avail: NTIS HC \$3.25 CSCL 08B

The author has identified the following significant results. The most significant finding has been the ability of the S-190B data to produce land use maps not far removed from the quality of high altitude aircraft photography generated maps.

**N75-12399\*#** Environmental Research Inst. of Michigan, Ann Arbor.

**STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, Sep. 1974**

Irvin J. Sattinger, Principal Investigator 15 Oct. 1974 2 p EREP

(Contract NAS9-13283)

(E75-10020; NASA-CR-140734; ERIM-103300-35-L) Avail: NTIS HC \$3.25 CSCL 08B

**N75-12400\*#** National Oceanic and Atmospheric Administration, Washington, D.C.

**A CLOUD PHYSICS INVESTIGATION UTILIZING SKYLAB DATA Quarterly Progress Report, Jul. - Sep. 1974**

John Alishouse, Herbert Jacobowitz, and David Wark, Principal Investigators Sep. 1974 4 p EREP

(NASA Order T-4715-B)

(E75-10021; NASA-CR-140735; QPR-6) Avail: NTIS HC \$3.25 CSCL 04A

**N75-12404\*#** Environmental Research Inst. of Michigan, Ann Arbor.

**STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY Monthly Progress Report, Oct. 1974**

Irvin J. Sattinger, Principal Investigator 20 Nov. 1974 5 p refs EREP

(Contract NAS9-13283)

(E75-10034; NASA-CR-140771; ERIM-103300-37-L) Avail: NTIS HC \$3.25 CSCL 08B

**N75-12406\*#** Environmental Research and Technology, Inc., Lexington, Mass.

**EXPERIMENTAL EVALUATION OF ATMOSPHERIC EFFECTS ON RADIOMETRIC MEASUREMENTS USING THE EREP OF SKYLAB Quarterly Progress Report, Aug. - Oct. 1974**

David T. Chang, Principal Investigator Oct. 1974 14 p EREP

(Contract NAS9-13343)

(E75-10036; NASA-CR-140773; QPR-6) Avail: NTIS HC \$3.25 CSCL 04B

**N75-12425\*#** ECON, Inc., Princeton, N.J.

**THE ROLE OF ERTS IN THE ESTABLISHMENT AND OF A NATIONWIDE LAND COVER INFORMATION SYSTEM**

Philip Abram and Jay Tullos 31 Oct. 1974 302 p refs Original contains color illustrations

(Contract NASw-2558)

(NASA-CR-141045; Rept-74-2001-7) Avail: NTIS HC \$9.25 CSCL 05B

The economic potential of utilizing an ERTS type satellite in the development, updating, and maintenance of a nation-wide land cover information system in the post-1977 time frame was examined. Several alternative acquisition systems were evaluated for land cover data acquisition, processing, and interpretation costs in order to determine, on a total life cycle cost basis, under which conditions of user demand (i.e., area of coverage, frequency of coverage, timeliness of information, and level of information detail) an ERTS type satellite would be cost effective, and what the annual cost savings benefits would be. It was concluded that a three satellite system with high and low altitude aircraft and ground survey team utilizing automatic interpretation and classification techniques is an economically sound proposal.

Author

**N75-12459#** Varian Associates, Palo Alto, Calif.  
**AIRBORNE VAPOR SURVEILLANCE SYSTEM Final Report**  
 James T. Arnold and Paul Robbiano Jun. 1974 45 p refs  
 (Contract DAAD05-70-C-0197)  
 (AD-785585; LWL-CR-03P688) Avail: NTIS CSCL 07/4

The report describes a transportable membrane separator-mass spectrometer system for the detection of trace vapors in ambient atmosphere. It employs a Llewellyn membrane separator, a quadrupole mass filter, and an on line system for data processing and display. Design electronics, and software are discussed, and installations in a mobile van and a fixed-wing aircraft are described. GRA

**N75-12482\*#** National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.

**APPLICATION OF A SINGLE LASER DOPPLER SYSTEM TO THE MEASUREMENT OF ATMOSPHERIC WINDS**  
 William C. Cliff and Robert M. Huffaker Oct. 1974 23 p refs  
 (NASA-TM-X-64891) Avail: NTIS HC \$3.25 CSCL 048

The feasibility of employing a single laser Doppler velocimeter (LDV) system to remotely measure one-, two-, and three-dimensional velocity components in atmospheric flow fields is presented. A focused continuous wave CO<sub>2</sub> laser emitting at the 10.6  $\mu$  wavelength is used as the laser source. Scan configurations employed by the LDV system were single-point, two-point, conical, and spiral conical. Test results are presented, which include favorable comparisons of velocity components measured by conventional anemometry and the LDV system. The feasibility using a single-beam LDV employing a conical scan technique for measuring two- and three-dimensional mean winds. Measurements to 300 m in dense fogs showed the ability of the LDV system to operate in dense fogs. Author

**N75-12483\*#** Scientific Translation Service, Santa Barbara, Calif.  
**DUST STORMS ACCORDING TO DATA OF SPACE RESEARCH**

A. A. Grigoryev and V. B. Lipatov Washington NASA Nov. 1974 39 p refs Transl. into ENGLISH of the book "Pylynye Buri po Dannym Kosmicheskikh Issledovaniy" Moscow, Hydrometeorological Press, 1974 p 1-31  
 (Contract NASw-2483)  
 (NASA-TT-F-16021) Avail: NTIS HC \$3.75 CSCL 08E

The main regions of dust storms in the arid and sub-arid zones and the transfer paths of the dust materials were studied. Relationships between the dust storms and synoptic character and composition of the underlying surfaces are analyzed. The feasibility of studying the dynamics of these phenomena using space imagery is shown. The possibility of using microphotometry from TV pictures is considered for estimating the structure of dust storms. Author

**N75-12487#** Defence Research Establishment Ottawa (Ontario). Research and Development Branch.

**AN EXAMINATION OF WHITEOUTS AND TRANSMISSION THROUGH ICE FOG IN THE VISIBLE AND NEAR INFRARED**

R. J. Brown, J. D. R. Pattman, and D. J. DiFruscio Jul. 1974 20 p refs  
 (DREO-TN-74-18) Avail: NTIS HC \$3.25

Closed circuit television was investigated as a means of improving contrast during whiteout conditions at Yellowknife, N.W.T., in December, 1973. Cameras sensitive in the visible and near infrared portions of the electromagnetic spectrum were used. It is predicted that the reduction of snow reflectance in the near infrared might improve contrast perception in this region over that in the visible. Further studies included an investigation of the ability of these cameras to penetrate ice fog and the measurements of sky illuminance using a four spectral channel radiometer. No appreciable advantage over unaided eye observations was detected, and, in most cases, binoculars provided the most effective visual aid. Author

**N75-12546\*#** Alabama Univ., Huntsville.  
**DETERMINATION OF POINTS OF ENTRY FOR POTENTIAL CONTAMINANTS INTO LIMESTONE AQUIFERS USING**

**THERMAL INFRARED IMAGERY Interim Report**

F. L. Doyle 31 Oct. 1974 19 p refs  
 (Contract NAS8-30216)  
 (NASA-CR-120540) Avail: NTIS HC \$3.25 CSCL 08I

Lineations were identified involving the application of ERTS imagery to geologic and hydrologic problems. Interpretation of the southwest Madison County area is discussed. The tracing of the Beech Grove lineament to the northern boundary of Madison County, Alabama raises the question of its relationship to the trend of lineations in southwestern Madison County. The use of thermography as an indication of soil moisture is reviewed. The effect of soil moisture on surface temperature and the relationship between soil moisture and ground water are examined. J.A.M.

**N75-13063#** Tennessee Univ., Knoxville.  
**INVESTIGATION OF THE UTILITY OF KINETICALLY CONTROLLED AND CATALYTIC REACTIONS TO PERFORM ENVIRONMENTAL DETERMINATIONS BY PARALLEL SPECTROPHOTOMETRIC ANALYSIS Ph.D. Thesis**  
 J. L. Bowling Mar. 1974 102 p refs Sponsored by AEC  
 (TID-26594) Avail: NTIS HC \$5.25

The analytical performance of the GeMSAEC spectrophotometric analyzer and the principles of parallel analysis which it employs were evaluated with respect to several important environmental species. The GeMSAEC system used was interfaced with a small computer for data collection and treatment. The production of formaldehyde from the selective cleavage of the double bond of 4-allyl 2-methoxy phenol (eugenol) by ozone permitted the specific determination of ozone in air samples. A rapid ion exchange separation converted the methylene blue spot test for selenium into a selective and sensitive method for quantitative determination of trace selenium. A modified GeMSAEC system was used for chemiluminescence studies. The use of EDTA as a general masking agent permitted the determination of chromium using the transition metal catalyzed reduction of luminol by basic hydrogen peroxide. The ability of the GeMSAEC to perform rapid, accurate, and reproducible analyses was demonstrated. Author (NSA)

**N75-13334\*#** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Tex.

**THE ERTS-1 INVESTIGATION. VOLUME 7: ERTS-1 LAND-USE ANALYSIS OF THE HOUSTON AREA TEST SITE Final Report, Jul. 1972 - Jun. 1973**

R. Bryan Erb, Principal Investigator Jun. 1974 110 p refs  
 Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS  
 (E75-10009; NASA-TM-X-58124) Avail: NTIS HC \$5.25 CSCL 08B

**N75-13337\*#** Brevard County Planning Dept., Titusville, Fla.  
**PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA Progress Report, 1 Aug. - 30 Sep. 1974**

John W. Hannah, Principal Investigator, Garland L. Thomas, Fernando Esparza (NASA, Kennedy Space Center), and James J. Millard (NASA, Kennedy Space Center) 30 Sep. 1974 21 p ERTS  
 (Contract NAS5-21847)

(E75-10015; NASA-TM-X-72076) Avail: NTIS HC \$3.25 CSCL 08B

**N75-13339\*#** Nebraska Univ., Lincoln.  
**SATELLITE PICTURES CAN HELP GUIDE SANDHILLS IRRIGATION**

James V. Drew, Principal Investigator, David T. Lewis, Leslie F. Sheffield, and Paul M. SeEVERS 27 Sep. 1974 3 p Repr. from Nebraska Farmer, 7 Sep. 1974 p 38-40 Original contains

## 02 ENVIRONMENTAL CHANGES AND CULTURAL RESOURCES

imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS  
(Contract NAS5-21756)  
(E75-10023; NASA-CR-140737) Avail: NTIS HC \$3.25 CSCL 08H

**N75-13343\*#** Environmental Research Inst. of Michigan, Ann Arbor.  
**OIL POLLUTION DETECTION, MONITORING AND LAW ENFORCEMENT Quarterly Progress Report, Aug. 1974**  
Robert Horvath, Principal Investigator 22 Oct. 1974 2 p EREP  
(Contract NAS9-13281)  
(E75-10027; NASA-CR-140740; ERIM-101800-14-P) Avail: NTIS HC \$3.25 CSCL 08J

**N75-13356\*#** Geological Survey, Reston, Va.  
**URBAN AND REGIONAL LAND USE ANALYSIS: CARETS AND CENSUS CITIES EXPERIMENT PACKAGE Monthly Progress Report, Oct. 1974**  
Robert Alexander, Principal Investigator and Harry F. Lins, Jr. Oct. 1974 2 p EREP  
(NASA Order T-5290-B)  
(E75-10056; NASA-CR-140964) Avail: NTIS HC \$3.25 CSCL 08B

**N75-13369#** Council for Scientific and Industrial Research, Pretoria (South Africa).  
**[RESEARCH IN EARTH RESOURCES UTILIZATION, PHYSICAL ENGINEERING, AND POLLUTION] Annual Report, 1973**  
1974 87 p refs  
(AR-29) Avail: NTIS HC \$4.75

The 1973 retrospective account of the various cooperative research activities provides photographs and descriptions of advancements in the following fields: (1) chemistry and physics; (2) geomagnetism; (3) astronomy; (4) telecommunications; (5) mechanical and electrical engineering; (6) water and food research; (7) air pollution; (8) road and building technology; and (9) timber and textile research. The information systems that were designed to disseminate the data gained from the research are also described. A.A.D.

**N75-13372\*#** National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.  
**COMPUTER AND PHOTOGRAMMETRIC GENERAL LAND USE STUDY OF CENTRAL NORTH ALABAMA**

R. R. Jayroe, P. A. Larsen, and C. W. Campbell Washington Oct. 1974 114 p refs Original contains color illustrations  
(NASA-TR-R-431; M-130) Avail: NTIS HC \$5.25 CSCL 08B

The object of this report is to acquaint potential users with two computer programs, developed at NASA, Marshall Space Flight Center. They were used in producing a land use survey and maps of central north Alabama from Earth Resources Technology Satellite (ERTS) digital data. The report describes in detail the thought processes and analysis procedures used from the initiation of the land use study to its completion, as well as a photogrammetric study that was used in conjunction with the computer analysis to produce similar land use maps. The results of the land use demonstration indicate that, with respect to computer time and cost, such a study may be economically and realistically feasible on a statewide basis. Author

**N75-13419#** Air Force Avionics Lab., Wright-Patterson AFB, Ohio.

**AN APPLICATION OF INFRARED REMOTE SENSING TECHNIQUES TO ECOLOGICAL PROBLEMS**

L. W. Crouch and R. D. Mower Jul. 1974 48 p  
(AD-786028; AFAL-TR-74-98) Avail: NTIS CSCL 13/2

The report and compendium of aerial infrared imagery was extracted from an R and D laboratory test of an Air Force infrared scanner. The purpose of the R and D test was to demonstrate the ability of one Air Force scanner to display thermal differentials found in a ground scene. The flight test area included a series of waterways and contiguous shorelines which illustrate ecological thermal phenomena. Specific examples of imagery were extracted from the R and D test program data for inclusion in this report. A summary of pertinent infrared technology is presented which relates sensor performance to atmospheric conditions, target and background characteristics, as well as image information content. In addition, brief photographic interpretation comments are included for each infrared image.

Author (GRA)

**N75-13437#** Suomalainen Tiedeakatemia, Helsinki (Finland).  
**IONOSPHERIC MEETING**  
Oct. 1973 12 p Meeting held at Sodankyla, 14-16 May 1973

(Rept-3) Avail: NTIS HC \$3.25 CSCL 03B

Techniques in ionogram scaling are reviewed, along with parameters and difficulties in latitude ionospheric sounding. Blank and fixed gain ionograms are proposed for publication. Experiments on ionogram sequencing, fixed frequency recordings, interferometers, and polarimeters are presented. J.A.M.

**N75-13452\*#** Chicago Univ., Ill. Dept. of the Geophysical Sciences.

**REMOTE SOUNDING OF STRATOSPHERIC TEMPERATURES USING HIGH RESOLUTION RADIANCE MEASUREMENTS FROM THE IRIS-D M.S. Thesis**

William O. Gallery Dec. 1974 119 p refs  
(Grant NGR-14-001-194)

(NASA-CR-141130) Avail: NTIS HC \$5.25 CSCL 04A

Remote sounding of stratospheric temperatures up to 3.2 millibars is attempted using high resolution (unapodized) radiance measurements in the 15 micron CO<sub>2</sub> band from the infrared Interferometer Spectrometer on Nimbus 4. Inversions are performed using the Chahine relaxation technique. Radiance data and simultaneous in situ temperature profiles are obtained from the Rocket/Nimbus Sounder Comparison. Numerical tests with synthetic radiance data show that the uncertainty in the retrieved temperatures due to random instrument noise is about 1.1 K when averaged over layers about 10 km thick. However, comparison of the measured radiances with the radiances calculated from the in situ profiles show the calculated radiances to be systematically higher than the measured radiances. The evidence indicates that systematic errors exist in both the radiance and the in situ measurements. Author

**N75-13458#** California Univ., Livermore. Lawrence Livermore Lab.

**ENVIRONMENTAL DEFINITION PROGRAM Final Report, period ending 30 Jun. 1974**

J. B. Knox and J. E. Lovill 25 Jul. 1974 12 p Sponsored in part by DNA

(Contract W-7405-eng-48)

(UCID-16565) Avail: NTIS HC \$3.25

Satellite monitoring of the stratosphere and troposphere is conducted to provide thousands of vertical profiles each day of temperature, water vapor, ozone, ice and liquid cloud contents, and various discrete radiational emission spectra. The data acquired and computer codes being developed to analyze the data are discussed. NSA



**N75-13479** Freie Univ., Berlin (West Germany). Inst. Fuer Meteorologie.

**METEOROLOGICAL DATA. VOLUME 145 NO. 1: THE EUROPEAN CLIMATOLOGY 1974 METEOROLOGICAL SATELLITE DATA FROM THE BERLIN ZONE OF RECEPTION, PART 1, 1ST QUARTER [METEOROLOGISCHE ABHANDLUNGEN. BAND 145, HEFT 1: DAS EUROPAEISCHE WETTERBILD 1974, WETTERSATELLITEN-DATEN AUS DEM BERLINER EMPFANGSBEREICH, TEIL 1, 1. VIERTELJAHR]**

1974 199 p In GERMAN

Avail: Issuing Activity

The present volume continues the daily European weather maps for the first quarter, 1974. Collected are APT photographs from ESSA 8 and film strips from the NOAA 2 scanning radiometer.

Transl. by G.G.

**N75-13483** Freie Univ., Berlin (West Germany). Inst. for Meteorology.

**METEOROLOGICAL DATA. VOLUME 139, NO. 4: THE EUROPEAN CLIMATOLOGY, 1973. METEOROLOGICAL SATELLITE DATA FROM THE BERLIN ZONE OF RECEPTION, PART 4, FOURTH QUARTER [METEOROLOGISCHE ABHANDLUNGEN. BAND 139, HEFT 4: DAS EUROPAEISCHE WETTERBILD 1973 WETTERSATELLITEN-DATEN AUS DEM BERLINER EMPFANGSBEREICH, TEIL 4, 4. VIERTELJAHR]**

1973 202 p In GERMAN

Avail: Issuing Activity

The present volume continues the daily European weather maps for the 4th quarter in 1973. Collected are APT photographs from ESSA 8 and film strips from the NOAA 2 scanning radiometer.

Transl. by G.G.

**N75-14198\*** Boeing Co., Kent, Wash.

**QUANTITATIVE DETERMINATION OF STRATOSPHERIC AEROSOL CHARACTERISTICS** Monthly Report, Nov. 1974 David L. Tingey, Principal Investigator Nov. 1974 1 p EREP (Contract NAS9-13303)

(E75-10079; NASA-CR-141092) Avail: NTIS HC \$3.25 CSCL 04A

**N75-14201\*** Ohio Dept. of Economic and Community Development, Columbus.

**THE APPLICATION OF SKYLAB EREP DATA FOR LAND USE CLASSIFICATION AND MAPPING IN THE CLEVELAND AND COLUMBUS AREAS**

David C. Sweet, Principal Investigator, Paul Pincura, George E. Wukelinc, Joachim G. Stephan, Harry E. Smail, and Thomas F. Ebbert Apr. 1974 28 p Prepared in cooperation with Battelle Columbus Labs., Ohio Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP (NASA Order C-21372-C)

(E75-10083; NASA-CR-141107) Avail: NTIS HC \$3.75 CSCL 08B

**N75-14226** Telespazio, S.p.A., Rome (Italy).

**DIGITAL LAND-USE CLASSIFICATION USING AN ERTS-1 IMAGE**

B. Ratti and F. Capozza In ESRO European Earth-Resources Satellite Expts. May 1974 p 93-105 refs

Initial work on digital land use classification was carried out utilizing an ERTS-1 MSS frame for an area centered on Rome. The high variability of ground cover types, inherent in the region under investigation, had led to use clustering (i.e. unsupervised) techniques rather than supervised techniques, which call for

acquisition of substantial amounts of ground-truth information to be effective. In this initial approach, a simplified clustering algorithm was used. The ground cover types were divided into 12 classes, plus one class for points not assigned to any of these 12. The region classified covers approximately 1000 sq km. The results were very encouraging. Further work is being carried out to improve the clustering procedures, with accompanying improvements in classification accuracy. Author (ESRO)

**N75-14245** Strasbourg Univ. (France).

**ERTS-1 CONTRIBUTIONS TO THE ECOGENETICAL KNOWLEDGE OF THE LLANOS OF THE ORINOCO (COLOMBIA AND VENEZUELA) [APPORTS DE ERTS-1 A NOTRE CONNAISSANCE ECOGENETIQUE DES LLANOS DE L'ORENOQUE (COLOMBIE ET VENEZUELA)]**

J. Tricart In ESRO European Earth Resources Satellite Expts. May 1974 p 317-324 refs In FRENCH; ENGLISH summary

Satellite multispectral photographs were used for reconnaissance of the Orinoco Llanos. These photographs, combined with verification on the ground, provide a small-scale overall view which helps to bring out the main features of the ecogenesis. The sandy deposits built up along the rivers up to about 6 deg N were affected by strong wind action, which formed slightly bow-shaped longitudinal dunes lying in a direction between ENE-WSW and NNE-SSW. At the western and southern extremities of the region the dunes form folds on the southern banks of the rivers, invading the edge of sand-clay interfluvies formed from older materials. The dunes were partially drowned by Holocene silt-clay material and probably date from the pre-Flandrian regression. Dune plant cover degradation, by cattle during flooding, leads to wind reactivation. Any rational development of this area should take these phenomena into account.

Author (ESRO)

**N75-14248** Centre d'Etudes Phytosociologiques et Ecologiques, Montpellier (France).

**QUALITATIVE STUDY OF SOME ERTS-1 IMAGES OF THE GOLION PROJECT. ECOLOGICAL ASPECTS OF TERRESTRIAL ENVIRONMENTS [ETUDE QUALITATIVE DE QUELQUES IMAGES ERTS-1 DU PROJET GOLION. ASPECTS ECOLOGIQUES DES MILIEUX TERRESTRES]**

G. Caballe, B. Lacaze, and G. Long In ESRO European Earth Resources Satellite Expts. May 1974 p 363-370 refs In FRENCH; ENGLISH summary Sponsored jointly by CNES and Direc. des Rech. et Moyens d'Essais

The main results of an initial study of the ERTS-1 imagery (MSS, 4 channels) of the GOLION Project southern (France) are presented. The aim is to demonstrate that, from an objective analysis of the images on a scale of 1:1,000,000 studied channel-by-channel or by comparison, it is possible to discern homogeneous or isophenic zones which contribute to global thematic data (chiefly geomorphology, vegetation and land use). Over a test area of 1200 sq km, 24 zones were determined on the basis of the image criteria and their variations. The conclusions from this qualitative approach will serve as basic assumptions for a quantitative, multispectral study using digital data. Because of the erratic nature of the images received, it was not possible to make an effective time-sequence study. The value of ecographic satellite images for the definition of ecological regions is commented upon.

Author (ESRO)

**N75-14250** Reading Univ. (England). Dept. of Geography. **A COMPARISON OF THE CAPABILITIES OF ERTS-1 AND THE SKYLARK EARTH-RESOURCES ROCKET FOR RESOURCES SURVEYING IN CENTRAL ARGENTINA**

J. R. G. Townshend, R. A. G. Savigear, C. O. Justice, J. R. Hardy, D. S. H. Drennan, and C. J. Bray In ESRO European Earth Resources Satellite Expts. May 1974 p 381-403 refs Original contains color illustrations

(Contract AT/2035/025)

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An evaluation of the potential of photographs from the earth-resources Skylark rocket was made in a joint Anglo-Argentinian project. Part of this program consists of a resources evaluation, and comparisons were made with imagery of the same area obtained from ERTS-1. These two space platform resource systems have several differences which affect their utility for different resource-evaluation tasks. With high resolution emulsion and long focal length cameras, the resolution of the Skylark photography is significantly better than that of ERTS imagery. Comparisons of the two sets of imagery were made for a variety of features. Author (ESRO)

**N75-14331#** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Flugfunk und Mikrowellen.

**THEORETICAL INVESTIGATIONS ON THE DETERMINATION OF THE VERTICAL TEMPERATURE DISTRIBUTION IN THE ATMOSPHERE ASSUMING MULTISPECTRAL THERMAL RADIATION MEASUREMENTS AT 60 GHz [THEORETISCHE UNTERSUCHUNGEN IM HINBLICK AUF DIE BESTIMMUNG DER TEMPERATURVERTEILUNG IN DER ATMOSPHAERE UNTER DER ANNAHME MULTISPEKTRALER MESSUNGEN DER THERMISCHEN STRAHLUNG BEI 60 GHz]**

Friedrich Malota and Volker Stein Bonn Bundesmin. fuer Forsch. und Technol. Jul. 1974 71 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. fuer Forsch. und Technol. (BMFT-FB-W-74-04) Avail: NTIS HC \$4.25; ZLDI, Munich 14.95 DM

Vertical atmospheric temperature distribution was derived from microwave thermal radiation measurements. The radiation transfer equation is discussed, notably correlation between environmental temperature and noise temperature, temperature distribution models and the influence of clouds on noise temperature. Information content and numerical solution methods of indirect temperature observations are dealt with, and noise temperature simulation calculations and inversion calculations for temperature profiles are presented. ESRO

**N75-14366\*** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

**SKYLAB ENVIRONMENTAL AND CREW MICROBIOLOGY STUDIES**

R. M. Brockett (School of Aerospace Med.), J. K. Ferguson, R. C. Graves, T. O. Groves, M. R. Henney, C. J. Hodapp, K. D. Kropp, J. L. McQueen (Natl. Cancer Inst.), B. J. Mieszkuc, F. J. Pipes et al In its Proc. of the Skylab Life Sci. Symp., Vol. 1 Nov. 1974 p 121-143 refs

CSCL 06M

The results of some ground-based simulations have engendered theories that forecasted microbial simplification, intercrew transfer of microbial pathogens, autoinfections, and postflight microbial shock. In an effort to understand the effects of space flight, microbiological samples from multiple sites on the crewmembers were collected several times before, during, and after the space flights. The Skylab are related to analogous Apollo data and are discussed in a manner that will allow an evaluation of the validity of the hypotheses presented. Additionally, in-flight environmental samples were acquired from designated sites within the spacecraft and returned to earth for analysis. The resulting data were used to identify potential microbial problems for the maintenance of a habitable environment in the orbital workshop. Author

**N75-15100\*#** Cornell Univ., New York. Dept. of Natural Resources.

**EVALUATION OF SKYLAB IMAGERY AS AN INFORMATION SERVICE FOR INVESTIGATING LAND USE AND NATURAL RESOURCES** Progress Report

Ernest E. Hardy, Principal Investigator 31 Dec. 1974 8 p EREP

(Contract NAS9-13364)

(E75-10106; NASA-CR-141372) Avail: NTIS HC \$3.25 CSCL 08F

**N75-15104\*#** Tokyo Univ. (Japan).

**INVESTIGATION OF THE ENVIRONMENTAL CHANGE PATTERN OF JAPAN** Final Report, Jul. 1972 - Aug. 1973 Takakazu Maruyasu, Principal Investigator Oct. 1973 58 p Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS (E75-10086; NASA-CR-141150) Avail: NTIS HC \$4.25 CSCL 04B

The author has identified the following significant results. ERTS-1 imagery clearly identifies the relationships between the status of erosion, effluent patterns affected by the coastal current, and the cultural construction activities. Simple photographic techniques can be used for detecting water mass distribution separately from cloud cover and also noise caused by reflected sunlight from wave surfaces. Polluted water does not diffuse continuously into the oceanic water, but forms masses in the water in the Kuroshio area. The polluted or turbid water in the area just north of the Tomogashima Channel, the south outlet of the Osaka Bay, shows that the northward tidal current runs in a clockwise eddy at the tidal period when the imagery was taken. Such an eddy-like pattern of tidal current had never been revealed by conventional oceanographic data. A front between an oceanic water mass and a polluted water mass runs in a NW-SE direction in the central part of the Osaka Bay. The patterns of turbid water discharged from the Kii River and Yoshino River show a northward tidal current in the North Kii Straits. The pattern of lighter turbid or polluted water located in the northwest region of the North Kii Straits suggests the existence of a clockwise eddy in the straits.

**N75-15109\*#** Geological Survey, Reston, Va.

**URBAN AND REGIONAL LAND USE ANALYSIS: CARETS AND CENSUS CITIES EXPERIMENT PACKAGE** Monthly Progress Report

Robert Alexander, Principal Investigator, Daniel B. Gallagher, and Harry F. Lins, Jr. 20 Nov. 1974 3 p EREP (NASA Order T-5290-B)

(E75-10091; NASA-CR-141155) Avail: NTIS HC \$3.25 CSCL 08B

**N75-15110\*#** Environmental Research Inst. of Michigan, Ann Arbor.

**STUDY OF RECREATIONAL LAND AND OPEN SPACE USING SKYLAB IMAGERY** Monthly Progress Report, Nov. 1974

Irvin J. Sattinger, Principal Investigator 18 Dec. 1974 3 p EREP

(Contract NAS9-13283)

(E75-10092; NASA-CR-141156; ERIM-103300-40-L) Avail: NTIS HC \$3.25 CSCL 08B

The author has identified the following significant results. Despite almost uniform surface temperature conditions in the study area, the thermal imagery did illustrate the following possible uses: (1) Surface temperatures relative to 0 C reveal whether the snow and ice cover is wet and the melt pattern. This information is useful in hydrologic monitoring of runoff timing and rate, as well as indicating trafficability conditions on the snow. (2) When the surface temperature of snow and ice is below freezing, it may serve as an indicator of spatial variation of air temperatures. This information may be established by calculating the spatial variation of surface radiation budgets, etc. in observ-

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ing synoptic weather condition changes or local microclimatic effects. (3) Frozen inland lakes with less than about three or four inches of snow over the ice may be differentiated from surrounding snow covered land areas; this is not always feasible in visible wavelength imagery. The feasibility of this application decreases as the ice thickness increases.

**N75-15114\*#** Environmental Research Inst. of Michigan, Ann Arbor.

**DETERMINATION OF THE EARTH'S AEROSOL ALBEDO USING SKYLAB DATA** Quarterly Progress Report, Aug. - Dec. 1974

Robert E. Turner, Principal Investigator 13 Jan. 1975 2 p EREP

(Contract NAS9-13279)

(E75-10096; NASA-CR-141292; ERIM-102200-14-L) Avail: NTIS HC \$3.25 CSCL 04A

**N75-15117\*#** National Oceanic and Atmospheric Administration, Washington, D.C.

**A CLOUD PHYSICS INVESTIGATION UTILIZING SKYLAB DATA** Quarterly Progress Report, Oct. - Dec. 1974

John Alishouse, Herbert Jacobowitz, and David Wark, Principal Investigators Dec. 1974 5 p EREP

(NASA Order T-4715-B)

(E75-10099; NASA-CR-141295; QPR-7) Avail: NTIS HC \$3.25 CSCL 04A

**N75-15118\*#** Geological Survey, Reston, Va.

**URBAN AND REGIONAL LAND USE ANALYSIS: CARETS AND CENSUS CITIES EXPERIMENT PACKAGE** Monthly Progress Report

Robert Alexander, Principal Investigator and Harry F. Lins, Jr. 27 Dec. 1974 4 p EREP

(NASA Order T-5290-B)

(E75-10100; NASA-CR-141296) Avail: NTIS HC \$3.25 CSCL 08B

**N75-15121\*#** Maine State Highway Dept., Bangor.

**MULTIDISCIPLINARY ANALYSIS FOR HIGHWAY ENGINEERING PURPOSES** Progress Report

Ernest G. Stoekeler, Raymond G. Woodman, and Robert S. Farrell, Principal Investigators 6 Nov. 1974 7 p EREP

(Contract NAS9-13359)

(E75-10103; NASA-CR-141304; PR-4) Avail: NTIS HC \$3.25 CSCL 13B

**N75-15123\*#** Colorado School of Mines, Golden. Dept. of Geology.

**GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA** Monthly Progress Report, Dec. 1974

Keenan Lee, Principal Investigator 20 Jan. 1975 4 p EREP

(Contract NAS9-13394)

(E75-10105; NASA-CR-141306) Avail: NTIS HC \$3.25 CSCL 08G

**N75-15126\*#** Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

**THE AVAILABILITY OF LOCAL AERIAL PHOTOGRAPHY IN SOUTHERN CALIFORNIA**

Walter Allen, Brenda Sledge, Charles K. Paul, and Albert J. Landini 1 L 74 J20

(Contract NAS7-100)

(NASA-CR-141314; JPL-SP-43-14) Avail: NTIS HC \$3.75 CSCL 14E

Some of the major photography and photogrammetric suppliers and users located in Southern California are listed. Recent trends in aerial photographic coverage of the Los Angeles basin area are also noted, as well as the uses of that imagery.

Author

**N75-15135#** California Univ., Berkeley. School of Forestry and Conservation.

**USEFULNESS OF REMOTE SENSING TECHNIQUES FOR THE ENVIRONMENTAL MONITORING OF THE SACRAMENTO-SAN JOAQUIN DELTA** Final Report

William C. Draeger 1 Feb. 1974 55 p refs Sponsored by Calif. Dept. of Water Resources

Avail: NTIS HC \$4.25

Information is presented on the capabilities of using remote sensing technology in an environmental monitoring program for the Sacramento-San Joaquin delta. Remote sensing literature pertaining to water quality measurement was reviewed to define the current state-of-the-art and to ascertain the possibility of evaluating the water quality parameters. Based on the findings of the review, a number of experimental aerial photo flights over the delta were conducted and coordinated with on-the-water measurements. Water quality parameters, the measurement accuracies needed, and the required frequency or timing of measurement are discussed. It was found that annual, small-scale color photographic coverage and periodic hand-held photography from a light plane permit subjective evaluations of direct on-the-water measurements.

M.J.S.

**N75-15199\*#** Miami Univ., Coral Gables, Fla. Dept. of Mechanical and Industrial Engineering.

**FEASIBILITY OF REMOTE SENSING FOR DETECTING THERMAL POLLUTION. PART 1: FEASIBILITY STUDY. PART 2: IMPLEMENTATION PLAN**

T. Nejat Veziroglu and Samuel S. Lee Dec. 1973 184 p refs (Contract NAS10-8402)

(NASA-CR-134453) Avail: NTIS HC \$7.00 CSCL 13B

A feasibility study for the development of a three-dimensional generalized, predictive, analytical model involving remote sensing, in-situ measurements, and an active system to remotely measure turbidity is presented. An implementation plan for the development of the three-dimensional model and for the application of remote sensing of temperature and turbidity measurements is outlined.

J.M.S.

**N75-15202#** California Univ., Livermore. Lawrence Livermore Lab.

**ATMOSPHERIC RELEASE ADVISORY CAPABILITY: RESEARCH AND PROGRESS**

J. B. Knox and T. V. Crawford 8 May 1974 33 p refs Presented at 2d AEC Pollution Control Conf., Albuquerque, New Mexico, 16 Apr. 1974 Revised

(UCRL-75644-Rev-2; Conf-740406-16) Avail: NTIS HC \$3.75

The purpose of the Atmospheric release advisory capability is to provide for real-time predictions of effects and dose-to-man of atmospheric releases of hazardous materials as rapidly and accurately as possible, to provide environmental surveillance and monitoring information in real-time, and to provide regional transport modeling capabilities. Planned technical milestones are given.

NSA

## 03 GEODESY AND CARTOGRAPHY

Includes mapping and topography.

**A75-10076** An electronic drawing aid for map compiling. R. R. Real, Y. Fujimoto, H. Moeller, and M. Paulun (National Research Council, Div. of Physics, Ottawa, Canada). *IEEE Transactions on Geoscience Electronics*, vol. GE-12, Oct. 1974, p. 134-139. 5 refs.

A versatile digital electronic drawing aid is described for assisting an operator in scribing map originals from stereo-orthophotos. These photographs permit the user to see an accurate, stable, and uniformly scaled stereo image of the earth's terrain. Direct measurement, planning and mapping within the stereo image is achieved with a simple instrument called a Stereocompiler. The drawing aid described has options that the operator of the Stereocompiler may use to facilitate the plotting of planimetry, contours, symbols, and the typescribing of alphanumeric annotation on map manuscripts while viewing the stereo image. (Author)

**A75-11861** On the longitudinal localization of the substorm active region and its changes during the substorm. V. A. Sergeev (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *Planetary and Space Science*, vol. 22, Sept. 1974, p. 1341-1343. 10 refs.

During the expansive phase of a substorm the active region frequently changes its situation by a jump, both to the evening and morning sectors. The typical interval between successive activations is often greater than about 10-20 min. It is emphasized that in such events the definition of a substorm phase for all the magnetosphere is ambiguous, because the conditions characteristic for different phases can be realized in different parts of the magnetosphere simultaneously. (Author)

**A75-11975** Solar wind and geomagnetic activity. V. Formisano, G. Moreno, and C. Signorini (CNR, Laboratorio per il Plasma nello Spazio, Frascati, Italy). *Nuovo Cimento, Sezione B*, vol. 23 B, Oct. 11, 1974, p. 473-488. 26 refs. Research supported by the Consiglio Nazionale delle Ricerche.

Interplanetary plasma and magnetic-field parameters, measured by the ESRO satellite HEOS-1, have been correlated with the D sub st, taken as an index of the overall geomagnetic activity. It is found that two different states exist for the interaction between the solar wind and the magnetosphere: they correspond to quiet periods (D sub st positive) and to disturbed conditions (main phase of geomagnetic storms - i.e., D sub st negative). In disturbed conditions the magnetosphere appears to be much more sensitive to variations of the solar-wind dynamical pressure than in periods of positive D sub st. (Author)

**A75-14646 #** Geodetic aspects of laser distance measurements to the moon and radio-interference measurements to quasars. K. Arnold (Deutsche Akademie der Wissenschaften, Zentralinstitut für Physik der Erde, Potsdam, East Germany). *Gerlands Beiträge zur Geophysik*, vol. 83, no. 4, 1974, p. 249-269. 6 refs.

An investigation is conducted regarding the distance between a terrestrial observing station and a laser reflector on the moon, taking into account the functional relations between this distance and various parameters. Attention is given to the coordinates of the station, the parameters of polar motion, the deceleration of the earth's rotation, and the space coordinates of the reflector. The feasibility of a determination of the individual parameter values on the basis of the distance measurements is studied. G.R.

**A75-14683** Coherent optics potential applications to mapping. R. D. Leighty (U.S. Army, Engineer Topographic Laboratories, Fort Belvoir, Va.). (American Society of Photogrammetry and Society of Photo-Optical Instrumentation Engineers, Tutorial Seminar on Coherent Optics in Mapping, Rochester, N.Y., Mar. 27-29, 1974.) *Optical Engineering*, vol. 13, Sept.-Oct. 1974, p. 440-450. 96 refs.

Some of the roles for the potential application of coherent optical techniques in mapping systems are discussed. Other references on this subject are integrated into the overall framework of coherent optics in mapping processes. Potentials are defined in the eight areas of photogrammetric data reduction, image processing, optical memories, pattern recognition, performance prediction, holographic terrain displays, all-weather mapping, and field applications. T.S.

**A75-15435 \*** Mapping soil features from multispectral scanner data. S. J. Kristof and A. L. Zachary (Purdue University, West Lafayette, Ind.). *Photogrammetric Engineering*, vol. 40, Dec. 1974, p. 1427-1434. Grant No. NGL-15-005-112.

In being able to identify quickly gross variations in soil features, the computer-aided classification of multispectral scanner data can be an effective aid to soil surveying. Variations in soil tone are easily seen as well as variations in features related to soil tone, e.g., drainage patterns and organic matter content. Changes in surface texture also affect the reflectance properties of soils. Inasmuch as conventional soil classes are based on both surface and subsurface soil characteristics, the technique described here can be expected only to augment and not replace traditional soil mapping. (Author)

**A75-16676** Coherent optics in mapping; Proceedings of the Tutorial Seminar and Technology Utilization Program, Rochester, N.Y., March 27-29, 1974. Seminar sponsored by the American Society of Photogrammetry and Society of Photo-optical Instrumentation Engineers. Edited by N. Balasubramanian (Rochester, University, Rochester, N.Y.) and R. D. Leighty (U.S. Army, Engineer Topographic Laboratories, Fort Belvoir, Va.). Palos Verdes Estates, Calif., Society of Photo-optical Instrumentation Engineers (SPIE Proceedings. Volume 45), 1974. 305 p. \$30.

The present work gathers together studies dealing with, first, the fundamental concepts of coherent optics and photogrammetry in themselves, and second, the combination of coherent optics technology with photogrammetric mapping techniques. Some of the topics covered include: photogrammetric and reconnaissance applications of coherent optics, holographic moving map display, the mensuration and mapping of holograms and holographic stereo-models, terrain measurement from holographic stereograms, a system for photogrammetric data reduction using coherent optics, and cloud screening from aerial photography applying coherent optical pattern recognition techniques.

P.T.H.

**A75-17125 #** Plutonic structure of the earth's crust on space images. V. I. Makarov, S. F. Skobelev, V. G. Trifonov, P. V. Florenskii, and Iu. K. Shchukin (Akademii Nauk SSSR, Geologicheskii Institut, Moscow, USSR). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 369-437. 147 refs.

Examples from tectonically varied territories are analyzed to show that the plutonic structure of the earth's crust can be studied through the interpretation of black-and-white space photographs. Images with decreasing resolving power seem to reveal the structural elements of ever deeper layers. Applications of space photography to the study of deep seismically active zones and to oil and gas exploration are indicated. A.T.S.

### 03 GEODESY AND CARTOGRAPHY

**A75-17139 # Mapping of the 1973 Mississippi River floods by the NOAA-2 satellite.** D. R. Wiesnet, D. F. McGinnis, and J. A. Pritchard (NOAA, Hillcrest Heights, Md.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 621-627. 6 refs.

**A75-17201 # Single flight stereo radar capabilities.** G. E. Carlson and G. L. Bair (Missouri, University, Rolla, Mo.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1633-1647. 6 refs. Contract No. N00014-69-A-0141-0008. NR Project 387-069.

An improved single-flight technique for obtaining stereo radar image pairs is briefly described, as well as a previously proposed single-flight technique and a previously implemented two-flight technique. The results of tradeoff and theoretical performance analyses are presented for the improved single-flight technique, and theoretical performance comparisons are made with the two previous techniques. The results of an error analysis for the improved single-flight technique are presented and compared with similar results for the other two techniques. (Author)

**A75-17224 \* # Surface compositional mapping in the Wind River Range and Basin, Wyoming by multispectral techniques applied to ERTS-1 data.** B. Salmon and R. K. Vincent (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 2005-2012. Contract No. NAS5-21783.

**A75-17228 # Elements of the deep structure of the earth's crust on the space images of the East Caucasus.** V. G. Trifonov (Akademiia Nauk SSSR, Geologicheskii Institut, Moscow, USSR). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 2051-2053. 8 refs.

**A75-18055 Automatic contouring on the Gestalt Photomapper 2-1.** B. G. Crawley (Gestalt International, Ltd., Vancouver, Canada). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1974, p. 50-56.

The Gestalt Photomapper II distorts the scanned images from a stereo-pair of aerial diapositives to simulate an objective view from infinity. The distortion is done under controlled conditions established by the model, and in accordance with the X parallaxes sensed by an electronic correlator. When the images have been perfectly registered, the height matrix in the correlator's memory provides the data-base for the extraction of elevation contours for the scanned images. With GPM II, a systematic profile of the model in a patch-like manner, produces an orthophoto and a contour sheet of the overlap areas. (Author)

**A75-18062 \* Small scale thematic mapping - A case for radar imagery.** F. M. Henderson (New York, State University, Albany, N.Y.). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1974, p. 155-169. 24 refs. Contract No. NAS9-10261.

Small scale thematic maps (1:250,000 and smaller) of physical and cultural phenomena manifested on the landscape are a major concern to scientists and investigators in diverse disciplines. A strip of K-band radar imagery consisting of a traverse from eastern Minnesota to northern Utah was employed to evaluate the potential of radar imagery for small scale land use mapping. In the course of this investigation, it was discovered that certain borders derived from radar imagery were compatible with borders found on the nonland use thematic maps used for comparison. Specifically, numerous borders and regions of small scale maps of landforms, soils, vegetation, and geology are found to be similar to the radar land use regions. Although far from conclusive it appears that radar imagery can be employed in the small scale mapping of landforms and possibly for mapping physiognomic or economic vegetation. (Author)

**A75-18106 Geodesy and physics of the earth; Proceedings of the Second International Symposium, Potsdam, East Germany, May 7-11, 1973. Parts 1 & 2.** Symposium sponsored by the International Union of Geodesy and Geophysics. Edited by H. Kautzleben (Deutsche Akademie der Wissenschaften, Zentralinstitut für Physik der Erde, Potsdam, East Germany) and E. Buschmann. Potsdam, East Germany, Deutsche Akademie der Wissenschaften, Zentralinstitut für Physik der Erde (Zentralinstitut für Physik der Erde, Veröffentlichungen, No. 30. Parts 1 & 2), 1974. Pt. 1, 215 p.; pt. 2, 306 p. In English and German.

The dynamics of the entire earth are considered, taking into account the earth rotation and gravity variations, the effect of the core on the earth's rotation, the dynamics of the outer core, and the distribution of the gravimeter factor obtained from earth-tide observations in Europe. Other topics discussed are related to recent earth crust movements, the figure of the earth and the gravity field, and special problems of geodesy and geophysics. Attention is given to new methods for studying the dynamics of the entire earth and to problems and consequences of modern hypotheses on the global tectonics for geodesy and gravimetry.

G.R.

**A75-18109 # Problems and consequences of modern hypotheses on the global tectonics for geodesy and gravimetry.** H. Kautzleben (Deutsche Akademie der Wissenschaften, Zentralinstitut für Physik der Erde, Potsdam, East Germany). In: Geodesy and physics of the earth; Proceedings of the Second International Symposium, Potsdam, East Germany, May 7-11, 1973. Part 1. Potsdam, East Germany, Deutsche Akademie der Wissenschaften, Zentralinstitut für Physik der Erde, 1974, p. 47-64. 68 refs.

A review is presented of the hypothesis of plate tectonics. The hypothesis provides a kinematic picture regarding the fundamental structures of the earth's tectonosphere and the phenomena occurring in it. The geodetic evidence of secular movement processes is discussed along with gravimetric investigations and problems which have to be considered in the investigation of the earth's rotational behavior. (Author)

G.R.

**A75-18122 # The effect of the secular change of the terrestrial gravity field on elevation level differences (Der Einfluss der Säkularänderung des Erdschwerefeldes auf die nivellierten Höhenunterschiede).** P. Biro (Budapesti Műszaki Egyetem, Budapest, Hungary). In: Geodesy and physics of the earth; Proceedings of the Second International Symposium, Potsdam, East Germany, May 7-11, 1973. Part 2. Potsdam, East Germany, Deutsche Akademie der Wissenschaften, Zentralinstitut für Physik der Erde, 1974, p. 315-322. In German.

The elevation difference in geodesy is the distance of the corresponding equipotential surfaces of the gravity potential. This parameter can be very accurately determined by repeated levellings and gravity measurements. Current scientific studies of recent

movements of the earth's crust are based on the assumption that the form and location of the equipotential surfaces will not change with time. An investigation of the involved relations shows that currently only relative movements can be determined. G.R.

**A75-18123 #** Applications of satellite geodesy in the exploration of the internal structure of the earth (Anwendungsmöglichkeiten der Satellitengeodäsie bei der Erforschung der inneren Struktur der Erde). G. Barta (Eotvos Lorand Tudományegyetem, Budapest, Hungary). In: Geodesy and physics of the earth; Proceedings of the Second International Symposium, Potsdam, East Germany, May 7-11, 1973. Part 2. Potsdam, East Germany, Deutsche Akademie der Wissenschaften, Zentralinstitut für Physik der Erde, 1974, p. 351-356. In German.

Magnetic and gravitational evidence concerning the asymmetry of the internal structure of the earth and its temporal variations are given in brief and further possibilities of the study are discussed. An even more accurate approximation of the geoidal figure can be obtained if the axes of the approximating rotation-symmetrical forms will be located outside the plane of the equator. Such an investigation of static and dynamic phenomena can provide a better understanding for some features of the material of the core. Further seismological investigations are needed for a precise location of the position of the inner core. The study of the mass movements of the core may result in a better knowledge of the tectonical processes of the earth's surface. (Author)

**A75-18125 #** On the determination of secular variation in the earth's gravity field and of secular polar motion. V. F. Ieremeev and M. I. Iurkina (Tsentrāl'nyi Nauchno-Issledovatel'skii Institut Geodezii Aerofotos'emki i Kartografii, Moscow, USSR). In: Geodesy and physics of the earth; Proceedings of the Second International Symposium, Potsdam, East Germany, May 7-11, 1973. Part 2. Potsdam, East Germany, Deutsche Akademie der Wissenschaften, Zentralinstitut für Physik der Erde, 1974, p. 415-422. 8 refs.

The approach used in the determination of the secular variation in the earth's gravity field is based on the principles considered by Molodenskiy (1958). The problem can be solved if the components of the plane displacement of a point on the earth's surface and the elements of variation in the earth's gravity field can be expressed by means of smoothly varying functions of the plane coordinates. G.R.

**A75-18128 #** Use of terrestrial gravity data in combination with satellite results for determining geoid heights in Central Europe. W. Groten and R. Rummel (Darmstadt, Technische Hochschule, Darmstadt, West Germany). In: Geodesy and physics of the earth; Proceedings of the Second International Symposium, Potsdam, East Germany, May 7-11, 1973. Part 2. Potsdam, East Germany, Deutsche Akademie der Wissenschaften, Zentralinstitut für Physik der Erde, 1974, p. 441-454. 8 refs. Research supported by Deutsche Forschungsgemeinschaft.

**A75-18524 #** Possibilities of calculating the earth's local gravitational field from satellite observations (Vozmozhnosti vychisleniia lokal'nogo gravitatsionnogo polia zemli po nabludeniiam ISZ). Iu. Kh. Zhagar and N. V. Zhagar. In: Optimization of the treatment of satellite and time observations. Riga, Latvīskii Gosudarstvennyi Universitet, 1974, p. 75-83. In Russian.

**N75-10524#** Informatics, Inc., Rockville, Md. **SOVIET SATELLITE GEODESY: BASIS AND STATUS OF SOVIET LASER GEODESY AND LONG-BASE LINE INTERFEROMETRY** Interim Report. Stuart G. Hibben and Eleanor M. Rowell 15 May 1974 262 p refs (Contract F44620-72-C-0053) (AD-781138/3; AFOSR-74-0962TR) Avail: NTIS HC \$6.50 CSCL 08/5

Soviet developments in satellite geodesy are described in a survey of the literature, and by reports on observation and tracking stations, space triangulation networks, cameras used for satellite geodesy, laser geodesy, and long baseline interferometry. J1GRA

**N75-10528\*#** Geological Survey, Reston, Va. **OVERALL EVALUATION OF ERTS-1 IMAGERY FOR CARTOGRAPHIC APPLICATION** Final Report, 1 Jul. 1972 - 30 Jun. 1974. Alden P. Covocoreses, Principal Investigator 1 Jul. 1974 69 p refs Original contains imagery. Original photography contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS (NASA Order S-70243-AG) (E74-10800; NASA-CR-140494) Avail: NTIS HC \$4.25 CSCL 08B

The author has identified the following significant results. The conclusion reached is that an ERTS-type satellite has widespread cartographic application for scales of 1:250,000 and smaller. ERTS imagery also indicates those areas requiring revision at larger scales. For optimum cartographic application, ERTS must be flown continuously as temporal change (seasonal and long term) detection requires comparative coverage. ERTS is the first imagery system that lends itself to automated mapping wherein cartographic products may be produced in a matter of days rather than in months or years.

**N75-10625#** Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Applied Geomechanics. **THE PUCE PROGRAMME FOR TERRAIN EVALUATION FOR ENGINEERING PURPOSES. 2: PROCEDURES FOR TERRAIN CLASSIFICATION** K. Grant 1974 82 p refs (PB-233847/3; TP-19) Avail: NTIS HC \$7.25 CSCL 08F

Principles of terrain evaluation in accordance with the PUCE program for terrain evaluation for engineering purposes are outlined. A complete instruction manual is also provided on the art of terrain class classification conducted in accordance with the standard system incorporated as an integral part of the PUCE program. The manual includes as appendices the definitions of and numerical system for nomenclature of the terrain classes, class intervals for terrain parameters, and the Unified Soil Classification scheme. Also included as appendices are examples of standard terrain class description sheets, a glossary of standard terms to be used in terrain classification, and examples extracted from the complete classification of one area in Australia.

Author (GRA)

**N75-10641#** Woods Hole Oceanographic Institution, Mass. **CRUISE DATA REPORT. CHAIN 115 LEG 2, SOUTHLANT EXPEDITION** D. A. Richards, R. C. Groman, and S. R. Gegg Aug. 1974 25 p (Contract N00014-66-C-0241; NR Proj. 083-004) (AD-784421; WHOI-74-59) Avail: NTIS CSCL 08/10

The report summarizes the geological and geophysical activities which were undertaken during Leg 2 (Dakar to Cape Town) of R/V CHAIN Cruise 115 (SOUTHLANT Expedition). A series of charts and profiles display the navigational, bathymetry, total field magnetic anomaly, and free air gravity anomaly measurements, as well as the locations of coring, camera and hydrographic stations. Author (GRA)

**N75-10869#** Joint Publications Research Service, Arlington, Va. **STATUS AND PROSPECTS OF DEVELOPMENT OF SPACE GEODESY**

A. A. Izotov 18 Oct. 1974 16 p Transl. into ENGLISH from Geod. i Kartografiya (Moscow), no. 5, 1974 p 10-18 (JPRS-83231) Avail: NTIS HC \$3.25

The developments in space geodesy for studying the earth and circumterrestrial space are reviewed. Author

### 03 GEODESY AND CARTOGRAPHY

**N75-12395\*#** Iowa Univ., Iowa City. Dept. of Geology.  
**EXPERIMENT TO EVALUATE FEASIBILITY OF UTILIZING SKYLAB-EREP REMOTE SENSING DATA OF TECTONIC ANALYSIS OF THE BIGHORN MOUNTAINS REGION, WYOMING-MONTANA** Quarterly Progress Report, 1 Jul. - 30 Sep. 1974

Richard A. Hoppin, Principal Investigator 20 Oct. 1974 6 p EREP

(Contract NAS9-13313)

(E75-10014; NASA-CR-140650) Avail: NTIS HC \$3.25 CSCL 08G

**N75-12413\*#** Geological Survey, Denver, Colo.  
**REMOTE SENSING GEOPHYSICS FROM SKYLAB** Monthly Report, Jun. 1974

Kenneth Watson, Principal Investigator and H. A. Pohn Jun. 1974 2 p EREP

(NASA Order T-6555-B)

(E75-10045; NASA-CR-140782) Avail: NTIS HC \$3.25 CSCL 08G

**N75-13338\*#** California Earth Science Corp., Santa Monica.  
**FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA** Monthly Progress Report, Sep. 1974

Paul M. Merfield and Donald L. Lamar, Principal Investigators 5 Oct. 1974 4 p EREP

(Contract NAS2-7698)

(E75-10022; NASA-CR-140736; MPR-16) Avail: NTIS HC \$3.25 CSCL 08G

The author has identified the following significant results. ERTS and Skylab images reveal a number of prominent lineaments in the basement terrane of the Peninsular Ranges, Southern California. The major, well-known, active, northwest trending, right-slip faults are well displayed, but northeast and west to west-northwest trending lineaments are also present. Study of large-scale airphotos followed by field investigations have shown that several of these lineaments represent previously unmapped faults. Pitches of striations on shear surfaces of the northeast and west trending faults indicate oblique-slip movement; data are insufficient to determine the net-slip. These faults are restricted to the pre-Tertiary basement terrane and are truncated by the major northwest trending faults; therefore, they may have formed in response to an earlier stress system. Future work should be directed toward determining whether the northeast and west trending faults are related to the presently active stress system or to an older inactive system, because this question relates to the earthquake risk in the vicinity of these faults.

**N75-13340\*#** Smithsonian Astrophysical Observatory, Cambridge, Mass.

**MAPPING OF THE MAJOR STRUCTURES OF THE AFRICAN RIFT SYSTEM**

P. A. Mohr, Principal Investigator 29 Oct. 1974 90 p refs ERTS

(Contract NAS5-21748)

(E75-10024; NASA-CR-140738; SAO-Special-Rept-361; SAO-403-004) Avail: NTIS HC \$4.75 CSCL 08B

The author has identified the following significant results. The ERTS-1 satellite imagery has facilitated a major advance in accurate mapping and better understanding of the African Rift valleys. A unified scheme of mapping of the whole rift system, from Malawi to Ethiopia, has been accomplished. The structures revealed by the imagery are discussed in the light of known ground truth for the northern half of the African Rift System. The ERTS-revealed structures confirm the likelihood of a drift of Arabia away from Africa and impose constraints on the drift vectors. Numerous features have been newly recognized from

the imagery: the gently curvilinear plan of virtually all the African Rift valleys, the pervasive but not overriding degree of influence of Precambrian structures on rift faulting, the deep structural control of many rift volcanic centers, the occurrence of several unsuspected calderas both in the rifts and on the plateaus, and massive cauldron subsidence phenomena previously unknown to eastern Africa. Lithological mapping in eastern Africa can be greatly refined using the ERTS imagery, and new or revised subdivisions of the Precambrian appear possible and, in some places, necessary. Valleys excavated in the Ethiopian highlands by Pleistocene glaciers are newly recognized.

**N75-13352\*#** Geological Survey, Denver, Colo.  
**REMOTE SENSING GEOPHYSICS FROM SKYLAB** Monthly Report, Sep. 1974

Kenneth Watson, Principal Investigator and H. A. Pohn Sep. 1974 3 p EREP

(NASA Order T-6555-B)

(E75-10052; NASA-CR-140954) Avail: NTIS HC \$3.25 CSCL 08G

**N75-13359\*#** Naval Research Lab., Washington, D.C.  
**TERRAIN PROPERTIES AND TOPOGRAPHY FROM SKYLAB ALTIMETRY** Monthly Progress Report, Oct. 1974

Allan Shapiro, Principal Investigator 6 Dec. 1974 1 p EREP

(NASA Order T-4716-B)

(E75-10059; NASA-CR-140999) Avail: NTIS HC \$3.25 CSCL 08F

**N75-13364\*#** Battelle Columbus Labs., Ohio.  
**CALIBRATION AND EVALUATION OF SKYLAB ALTIMETRY FOR GEODETIC DETERMINATION OF THE GEOID** Progress Report, 1 Sep. - 30 Nov. 1974

A. G. Mourad, Principal Investigator, S. Gopalapillai, and M. Kuhner 12 Dec. 1974 18 p EREP

(Contract NAS9-13276)

(E75-10064; NASA-CR-141004; PR-19) Avail: NTIS HC \$3.25 CSCL 08E

**N75-13375#** Army Engineer Waterways Experiment Station, Vicksburg, Miss.

**AUTOMATED SELECTION AND LOCATION OF TERRAIN FEATURES ON THE BASIS OF SPECTRAL CHARACTERISTICS**

Albert N. Williamson, Jr. 26 Aug. 1974 16 p (AD-785698) Avail: NTIS CSCL 08/2

The report details data processing methods for converting multispectral scanner images, transmitted from a satellite, by application of computer techniques. GRA

**N75-13432#** Geophysical Observatory, Sodankyla (Finland).  
**GEOPHYSICAL VARIATIONS AT SODANKYLA DURING A GEOMAGNETIC STORM, 17-18 DECEMBER 1971**

Tauno Turunen and M. Mukunda Rao May 1974 21 p refs (Rept-9) Avail: NTIS HC \$3.25

Extremely bright auroras could be seen at Sodankyla and throughout Scandinavia on the night of 17 - 18 December 1971. A detailed study was undertaken of the geophysical phenomena observed at Sodankyla during this storm. The all-sky camera records, magnetograms, riometer records, and ionograms obtained at Sodankyla were analyzed in detail and published data from neighboring stations were examined to elucidate the extent of the geomagnetic storm and its effects on the upper atmosphere. It was noted that the occurrence of active auroral forms overhead was invariably followed by an increase of riometer absorption, and by changes in sporadic E. The analysis of this storm indicates that at least three substorms occurred during the main phase of the storm. Author

**N75-13454#** Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).

**AUSTRALIAN AND SOVIET GRAVITY SURVEYS ALONG THE AUSTRALIAN CALIBRATION LINE**

P. Wellman, Yu. O. Boulanger, B. C. Barlow, S. N. Scheglov, and D. A. Coutts 1974 177 p refs  
(Bull-161; ISBN-0-642-00853-1) Avail: NTIS HC \$7.00

The Australian calibration line (ACL), with a total gravity interval of 3 Gal, was established in 1970 between Laigam in Papua New Guinea and Hobart in Tasmania, and during 1973 the Australian Bureau of Mineral Resources and the U.S.S.R. Geodesy and Cartography Survey made joint observations along the full length of the ACL. Measurements made with eight Soviet GAG-2 gravity meters established a gravity scale for Australia to an accuracy of 2.5 parts in 10 to the 5th power. This scale and a datum of 979671.86 mGal for Sydney A were adopted for Australia in 1973. The complete data are shown in tabular form.

Author

**N75-13498#** Joint Publications Research Service, Arlington, Va.

**ANALYSIS OF METHODS FOR THE GEODETIC SUPPORT OF COMPLEX SEA GEOPHYSICAL SURVEYS**

I. F. Glumov, V. P. Glumov, and A. V. Smirnov 10 Dec. 1974 17 p refs Transl. into ENGLISH from Izv. Vysshikh Uchebn. Zavedenii, Geod. i Aerofotosemka (Moscow), no. 3, 1974 p 17-26

(JPRS-63621) Avail: NTIS HC \$3.25

Methods for determining position at sea and the range of applicability of each method in complex sea geophysical surveys are analyzed.

Author

**N75-14193\*#** California Earth Science Corp., Santa Monica. **FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA** Monthly Progress Report, Nov. 1974

Paul M. Merifield, Principal Investigator 5 Dec. 1974 2 p EREP

(Contract NAS2-7698)

(E75-10074; NASA-CR-141097; MPR-18) Avail: NTIS HC \$3.25 CSCL 08E

**N75-14197\*#** Geological Survey, Reston, Va.

**CARTOGRAPHIC EVALUATION OF SKYLAB-A S-192 SCANNER IMAGES** Quarterly Progress Report, 1 Aug. - 31 Oct. 1974

John D. McLaurin, Principal Investigator 31 Oct. 1974 3 p EREP

(NASA Order T-4111-B)

(E75-10078; NASA-CR-141093) Avail: NTIS HC \$3.25 CSCL 08B

**N75-14235** Hunting Surveys, Ltd., Boreham Wood (England). **NATURAL-RESOURCES MAPPING OF ETHIOPIA FROM ERTS-1 IMAGERY**

L. P. White In ESRO European Earth-Resources Satellite Expts. May 1974 p 179-184 Original contains color illustrations

The complete ERTS coverage of Ethiopia was used to examine its potential for mapping a variety of natural resources including soils and landforms, vegetation, and land use. The high planimetric accuracy of the imagery has proved invaluable in map compilation and in a number of cases major discrepancies were found in geographical detail between the imagery and the 1,000,000 base maps used for reference. The study confirms the experience of many investigators that the ERTS imagery can be used for a range of natural resources mapping to reconnaissance level, but the supplementary ground information necessary varies considera-

bly for each application. As well as the basic resource mapping capability, the sequential cover allows monitoring of dynamic situations, even of very subtle expression.

Author (ESRO)

**N75-14239** Technische Universitaet, Clausthal-Zellerfeld (West Germany).

**ERTS-1 DATA ON AFAR TECTONICS**

P. Kronberg, M. Schoenfeld, R. Guenther, P. Tsombos, and D. Bannert (Federal Inst. for Earth Res., Hanover) In ESRO European Earth Resources Satellite Expts. May 1974 p 217-229 refs Original contains color illustrations

(Grant WRK-213)

The Afar Triangle (Ethiopia), where the rift systems of the Red Sea and Gulf of Aden seem to meet, was one of the key areas for recent investigations of crustal-spreading problems. The evaluation of ERTS images led to the first detailed structural map covering the whole of the Afar and the adjacent areas. A lithological map was also compiled from ERTS data, covering the Afar and its surrounding areas. Correlations of ERTS data with data from photogeological mapping and from geological, petrological, and geophysical field observations were made. The evaluation of the ERTS-1 images has highlighted new aspects of the tectonics of the Afar and its geological history.

Author (ESRO)

**N75-14281#** Environmental Research Inst. of Michigan, Ann Arbor.

**THE REMOTE IDENTIFICATION OF TERRAIN FEATURES AND MATERIALS AT A CALIFORNIA TEST SITE: AN INVESTIGATIVE STUDY OF TECHNIQUES** Interim Report, Sep. 1972 - Dec. 1973

R. K. Vincent, R. D. Dillman, and P. G. Hasell, Jr. Apr. 1974 64 p refs

(Contract FH-11-7136)

(PB-235991/7; ERIM-196200-11-T; FHWA-RD-74-27) Avail: NTIS HC \$4.25 CSCL 08M

The collection, processing, and analysis of multispectral imagery gathered in airborne mapping of a site in the vicinity of Halloran Springs, California in the fall of 1972 are discussed. The general purpose is to develop techniques for automatically identifying selected terrain features and natural materials in remotely sensed imagery. Objectives were to automatically classify both soils of different textures or parent materials and rock outcrops based on (1) their spectral reflectance characteristics at ultraviolet, visible, and infrared wavelengths, and (2) their emissivity differences as noted in multiple thermal bands. The first objective was achieved; the second was not, primarily because of the poor performance of an experimental multiband thermal-wavelength detector.

GRA

**N75-14283#** Environmental Research Inst. of Michigan, Ann Arbor.

**THE REMOTE IDENTIFICATION OF TERRAIN FEATURES AND MATERIALS AT PENNSYLVANIA TEST SITES: AN INVESTIGATIVE STUDY OF TECHNIQUES** Interim Report, Apr. 1969 - Dec. 1972

Franklin G. Sadowski, Thomas W. Wagner, Philip G. Hasell, Jr., and Frederick J. Thomson Mar. 1974 93 p refs

(Contract FH-11-7136)

(PB-235992/5; ERIM-196200-5-T; FHWA-RD-74-9) Avail: NTIS HC \$4.75 CSCL 08M

The collection, processing, and analysis of multispectral imagery gathered in airborne mapping is reported. The specific objective was to automatically classify soils of different parent materials by surface spectral reflectance and emittance characteristics. Processing techniques included multispectral statistical pattern recognition, ratio processing, and single channel processing. Analog and digital procedures were utilized. The discrimination of bare soils was accomplished, but classification of soils according to parent material yielded unpromising results. An average spectral difference was noted between limestone-derived soils and sandstone- and shale-derived soils in the 11 channel visible and



### 03 GEODESY AND CARTOGRAPHY

near-IR spectral region. An apparent capability to improve the classification of soils despite albedo variation was demonstrated by using the ratio of five channels from the same region. Scan-angle variations indicated sufficient differences in the bidirectional reflectance characteristics to warrant correction of the data prior to processing. (Modified author abstract) GRA

**N75-14335#** Ohio State Univ., Columbus. Dept. of Geodetic Science.

#### **SOME FIRST ACCURACY ESTIMATES FOR APPLICATIONS OF AERIAL GRADIOMETRY**

Helmut Moritz Jul. 1974 78 p refs

(Contract F19628-72-C-0120; AF Proj. 8607)

(AD-786418; DGS-209; AFCRL-TR-74-0317; SR-18) Avail: NTIS CSCL 08/5

Estimates of accuracies obtainable in the geodetic use of aerial gradiometry are given. For simplicity, mainly the second vertical gradient  $T_{zz}$  is considered; the use of other gradients and their optimal combination by least-squares collocation is also outlined. GRA

**N75-15141#** Center for Naval Analyses, Arlington, Va. Warfare Analysis Group.

#### **THE GLOBAL COMPUTER PROGRAM AND GLOBEMAP: A SPECIAL PURPOSE THREE-DIMENSIONAL PLOTTER SUBROUTINE**

Lewis W. Linton Jul. 1974 45 p

(Contract N00014-68-A-0091)

(AD-785869; NWAG-Research-Contrib-266) Avail: NTIS CSCL 08/5

GLOBALL manipulates several smaller computer programs to calculate global ranges and surface areas. GLOBEMAP provides a three-dimensional map background upon which the ranges and areas may be presented. This paper is not intended to be a user's manual but to describe characteristics of these models and possible applications of them. Author (GRA)

**N75-15143#** Army Foreign Science and Technology Center, Charlottesville, Va.

#### **THE NEXT PROBLEMS IN THE AREA OF THE IMPLEMENTATION OF PLANNING FOR CARTOGRAPHICAL-GEODETIC WORK**

L. A. Kashin 21 Feb. 1974 12 p Transl. into ENGLISH from Geodeziya i Kartografiya (Moscow), no. 7, 1972 p 1-5

(AD-785882; FSTC-HT-23-1558-73) Avail: NTIS CSCL 08/5

Geodesy and cartography in the Soviet Union are discussed. A brief history of the improvements and changes over the past few years is given. GRA

**N75-15147#** Defense Mapping Agency Aerospace Center, St. Louis, Mo.

#### **FULLY AUTOMATED COMPILATION OF GRAVITY AND GEOPHYSICAL MAPS**

Luman E. Wilcox, Joe M. Estes, and Walter Czarnecki Sep. 1974 69 p refs

(AD-785838; DMAAC-TP-74-002) Avail: NTIS CSCL 08/2

A wide variety of gravity and geophysical maps can be produced by fully automated methods. The locations of gravity measurements, gravity anomaly values, gravity anomaly contours, continental outlines, title, legend, labels, and other data to be shown on the maps are computer generated, then drawn by automatic plotting equipment. This procedure is used to prepare charts showing the density and distribution of gravity data holdings, contoured gravity anomaly maps and other graphics needed for gravity data evaluation and mean anomaly prediction purposes, maps of gravity station elevations used as vertical control in topographic map compilation, and maps of glacial ice thickness for geophysical analysis. (Modified author abstract) GRA

**N75-15228#** Kakioka Magnetic Observatory (Japan).

#### **REPORT OF THE GEOMAGNETIC AND GEOELECTRIC OBSERVATIONS, 1972 (RAPID VARIATIONS)**

1973 76 p

(Rept-13) Avail: NTIS HC \$4.75

Results of observations of the Post-IGC, carried out by the Kakioka Magnetic Observatory in close cooperation with its two branch magnetic observatories, are presented. Standardization and comparison services of absolute magnetic instruments are operated by the electro-magnetic standard magnetometer A-56 and the proton precession magnetometer MO-P. Results of observations of rapid variations and records of the rapid-run induction magnetograms and rapid-run tellurigrams are included.

Author

**N75-15237#** Army Foreign Science and Technology Center, Charlottesville, Va.

#### **OPTICAL QUANTUM GENERATORS IN GEODETIC MEASUREMENTS**

M. T. Prilepin and A. N. Golubev 1974 182 p refs Transl. into ENGLISH of the book "Opticheskie Kvantovye Generatory v Geodezicheskikh Izmereniyakh" Moscow, 1972 168 p

(AD-787281; FSTC-HT-23-1170-73) Avail: NTIS CSCL 08/5

The book considers the theoretical and practical problems of the application of optical quantum generators in contemporary geodetic measurements. It also offers an analysis of completed experiments and describes laser geodetic apparatus and measuring systems and methods. The book is made up of four chapters. The first chapter will familiarize the reader with certain problems connected with the application of optical quantum generators. The second chapter is devoted to the use of lasers in terrestrial range finder systems. Pulse, phase, and interference methods of measuring distances using optical quantum generators are discussed. The third chapter discusses laser systems for measuring large distances (to the earth's artificial satellites and to the moon) and gives an analysis of the accuracy of such systems and describe experiments which have been conducted. In the fourth chapter other geodetic applications of optical quantum generators are discussed. GRA

## 04 GEOLOGY AND MINERAL RESOURCES

Includes mineral deposits, petroleum deposits, spectral properties of rocks, geological exploration, and lithology.

**A75-10437** Oil exploration needs for digital processing of imagery. F. F. Sabins, Jr. (Chevron Oil Field Research Co., La Habra, Calif.). (*American Society of Photogrammetry, Annual Convention, St. Louis, Mo., Mar. 11, 1974.*) *Photogrammetric Engineering*, vol. 40, Oct. 1974, p. 1197-1200.

Survey of the applications of digital image processing in the oil industry. The four major types of imaging sensors employed in oil exploration are aerial photography, thermal infrared, side-looking radar, and Earth Resource Technology Satellite (ERTS). ERTS imagery, because of its availability in a digital format and its use in reconnaissance studies, is shown to have the greatest potential in future digital processing. Well suited for exploration reconnaissance, ERTS imagery is characterized by broad regional coverage, acceptable resolution, and minimum image distortion. A discussion of the objectives and requirements of future image processing is included.

T.S.

**A75-11068 \*** A simulation of the San Andreas fault experiment. R. W. Agreen and D. E. Smith (NASA, Goddard Space Flight Center, Greenbelt, Md.). *Journal of Geophysical Research*, vol. 79, Oct. 10, 1974, p. 4413-4417. 9 refs.

The San Andreas fault experiment (Safe), which employs two laser tracking systems for measuring the relative motion of two points on opposite sides of the fault, has been simulated for an 8-yr observation period. The two tracking stations are located near San Diego on the western side of the fault and near Quincy on the eastern side; they are roughly 900 km apart. Both will simultaneously track laser reflector equipped satellites as they pass near the stations. Tracking of the Beacon Explorer C spacecraft has been simulated for these two stations during August and September for 8 consecutive years. An error analysis of the recovery of the relative location of Quincy from the data has been made, allowing for model errors in the mass of the earth, the gravity field, solar radiation pressure, atmospheric drag, errors in the position of the San Diego site, and biases and noise in the laser systems. The results of this simulation indicate that the distance of Quincy from San Diego will be determined each year with a precision of about 10 cm. Projected improvements in these model parameters and in the laser systems over the next few years will bring the precision to about 1-2 cm by 1980.

(Author)

**A75-17108 #** Geologic interpretation of ERTS-1 satellite images for East Aswan area, Egypt. E. M. El Shazly (Academy of Scientific Research and Technology, Cairo, Egypt), M. A. Abdel-Hady (Oklahoma State University, Stillwater, Okla.; Academy of Scientific Research and Technology, Cairo, Egypt), M. A. El Ghawaby, and I. A. El Kassas (Atomic Energy Establishment, Cairo, Egypt). In: *International Symposium on Remote Sensing of Environment*, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 105-117. 12 refs. Research supported by Oklahoma State University and NSF.

**A75-17109 #** Geologic interpretation of ERTS-1 satellite images for West Aswan area, Egypt. E. M. El Shazly (Academy of Scientific Research and Technology, Cairo, Egypt), M. A. Abdel-Hady (Oklahoma State University, Stillwater, Okla.; Academy of Scientific Research and Technology, Cairo, Egypt), M. A. El Ghawaby, and I. A. El Kassas (Atomic Energy Establishment, Cairo,

Egypt). In: *International Symposium on Remote Sensing of Environment*, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 119-131. 6 refs. Research supported by Oklahoma State University and NSF.

**A75-17126 #** Development of research in the USSR on the use of radar images for geological purposes. V. B. Komarov, V. A. Starostin, and B. P. Niyro (Ministry of Geology of the USSR, Leningrad; Akademiia Nauk SSSR, Moscow, USSR). In: *International Symposium on Remote Sensing of Environment*, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 441-444.

Side-looking airborne radar is widely used in the USSR for geological surveys. The radar images obtained are influenced by physical properties of the reflecting surface, such as density, and seasonal factors such as moisture content, vegetation, and snow cover. Correlation analysis is used to determine the dependence of the tone of the radar image on the surface characteristics. Correlation relationships established so far indicate that it is possible to determine quantitatively the moisture content and the density of loose dry-phase deposits from radar surveys.

A.T.S.

**A75-17207 #** Crude and refined petroleum oil structured luminescence signatures induced by UV laser or lamp and their remote sensing applications. H. G. Gross and M. Muramoto (McDonnell Douglas Astronautics Co., Huntington Beach, Calif.). In: *International Symposium on Remote Sensing of Environment*, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1747-1759. 6 refs. Research supported by the McDonnell Douglas Astronautics Independent Research and Development Funds.

**A75-17215 #** Geologic interpretation of infrared thermal images in East Qatrani area, Western Desert, Egypt. E. M. El-Shazly (Academy of Scientific Research and Technology, Cairo, Egypt), M. A. Abdel-Hady (Oklahoma State University, Stillwater, Okla.; Academy of Scientific Research and Technology, Cairo, Egypt), and M. A. Morsy (Atomic Energy Establishment, Cairo, Egypt). In: *International Symposium on Remote Sensing of Environment*, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1877-1889. 13 refs. Research supported by the Oklahoma State University and NSF.

**A75-17220 #** Remote sensing of rock type in the visible and near-infrared. J. W. Salisbury and G. R. Hunt (USAF, Terrestrial Sciences Laboratory, Bedford, Mass.). In: *International Symposium on Remote Sensing of Environment*, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1953-1958. 9 refs.

Visible and near-infrared spectra of minerals and rocks have been measured and evaluated in terms of remote sensing applications. We conclude that there are some differences in the spectral behavior of different rock types in the visible and near-infrared. These differences are, however, difficult or impossible to utilize in a generalized remote sensing effort in which the composition of all rocks is to be mapped. Instead, this spectral region lends itself best to precise and particular applications, such as enhancing the visibility of a rock unit with a known and distinctive spectral signature, or enhancing the contrast between rock units, or between rocks and the vegetative background.

(Author)

## 04 GEOLOGY AND MINERAL RESOURCES

**A75-17222 #** Application of radar imagery to environmental geologic mapping of Texas. P. J. Cannon (Texas, University, Austin, Tex.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1981-1988.

**A75-17225 #** Unsupervised mapping of geologic features and soils in California. R. D. Dillman and R. K. Vincent (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 2013-2025. 10 refs.

This paper describes a photographic and computer implemented method of analyzing and mapping the distribution of geologic materials at a test site near Halloran Springs, in Southern California. Laboratory spectral curves of selected rocks and minerals were used to calculate the ratio of reflectances using six bands, including two thermal bands. These laboratory ratio values were used to predict characteristic colors to be found on a color composite of three ratio images and also to train an analogue computer for automatic scene classification. In comparison with a geologic map prepared by ground survey, correct classification was as high as 77.9% using the ratio color composite. (Author)

**A75-17226 #** Remote sensing to detect the toxic effects of metals on vegetation for mineral exploration. N. P. Press (Nigel Press Associates, London, England). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 2027-2038. 26 refs. Research supported by the American Smelting and Refining Co., Barringer Research, Ltd., and Rio Tinto Zinc Corp.

**A75-17229 #** The use of space photos for search of oil and gas fields. P. V. Florenskii (Akademiia Nauk SSSR, Geologicheskii Institut; Moskovskii Institut Neftekhimicheskoi i Gazovoi Promyshlennosti, Moscow, USSR). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 2055-2058. 7 refs.

**A75-18065** Automatic mapping of strip mine operations from spacecraft data. R. H. Rogers, L. E. Reed (Bendix Corp., Aerospace Systems Div., Ann Arbor, Mich.), and W. A. Pettyjohn (Ohio State University, Columbus, Ohio). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1974, p. 204-219. 5 refs.

Computer techniques were applied to process ERTS tapes acquired over coal mining operations in southeastern Ohio on Aug. 21, 1972 and Sept. 3, 1973. ERTS products obtained included geometrically correct map overlays showing stripped earth, partially reclaimed earth, water, and natural vegetation. Computer-generated tables listing the area covered by each land-water category in square kilometers and acres were also produced. By comparing these mapping products, the study demonstrates the capability of ERTS to monitor changes in the extent of stripping, success of reclamation, and the secondary effects of mining on the environment. (Author)

**N76-10530\*#** Colorado School of Mines, Golden. Dept. of Geology.  
**GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA Monthly Progress Report, Sep. 1974**  
Keenan Lee, Principal Investigator Sep. 1974 4 p EREP  
(Contract NAS9-13394)  
(E74-10802; NASA-CR-140496) Avail: NTIS HC \$3.25 CSCI 08G

**N75-10536\*#** New York State Museum and Science Service, Albany.

### **ASSESSMENT OF ERTS-1 IMAGERY AS A TOOL FOR REGIONAL GEOLOGICAL ANALYSIS IN NEW YORK STATE Final Report**

Yngvar W. Isachsen, Principal Investigator, Robert H. Fakundiny, and Stephen W. Forster 28 May 1974 181 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS  
(Contract NAS5-21764)  
(E74-10809; NASA-CR-140503) Avail: NTIS HC \$7.00 CSCI 08G

The author has identified the following significant results. Linear anomalies dominate the new geological information derived from ERTS-1 imagery, total lengths now exceeding 26,500 km. Maxima on rose diagrams for ERTS-1 anomalies correspond well with those for mapped faults and topographic lineaments. Multi-scale analysis of linears shows that single topographic linears at 1:2,500,000 may become dashed linears at 1:1,000,000 aligned zones of shorter parallel, en echelon, or conjugate linears at 1:500,000, and shorter linears lacking any conspicuous zonal alignment at 1:250,000. Field work in the Catskills suggests that the prominent new NNE lineaments may be surface manifestations of dip slip faulting in the basement, and that it may become possible to map major joint sets over extensive plateau regions directly on the imagery. Most circular features found were explained away by U-2 airphoto analysis but several remain as anomalies. Visible glacial features include individual drumlins, drumlinoids, eskers, ice-marginal drainage channels, glacial lake shorelines, sand plains, and end moraines.

**N75-10537\*#** Tennessee Univ., Knoxville. Dept. of Geography.

### **GEOGRAPHIC APPLICATIONS OF ERTS-1 IMAGERY TO LANDSCAPE CHANGE Final Report**

John B. Rehder, Principal Investigator Dec. 1973 112 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS  
(Contract NAS5-21726)  
(E74-10810; NASA-CR-140504) Avail: NTIS HC \$5.25 CSCI 08F

The author has identified the following significant results. ERTS-1 has proven to be an effective earth-orbiting monitor of landscape change. Its regional coverage for large areal monitoring has been effective for the detection and mapping of agricultural plowing regions, for general forest cover mapping, for flood mapping, for strip mine mapping, and for short-lived precipitation mapping patterns. Paramount to the entire study has been the temporal coverage provided by ERTS. Without the cyclic coverage on an 18 day basis, temporal coverage would have been inadequate for the detection and mapping of strip mining landscape change, the analysis of agricultural landscape change based on plowing patterns, the analysis of urban-suburban growth changes, and the mapping of the Mississippi River floods. Cost benefits from ERTS are unquestionably superior to aircraft systems in regard to large regional coverage and cyclic temporal parameters. For the analysis of landscape change in large regions such as statewide areas or even areas of 10,000 square miles, ERTS is of cost benefit consideration. Not only does the cost of imagery favor ERTS but the reduction of man-hours using ERTS has been in the magnitude of 1:10.

**N75-10552\*** Geological Survey, Atlanta, Ga.  
**GEOLOGIC EVALUATION AND APPLICATIONS OF ERTS-1 IMAGERY OVER GEORGIA**

S. M. Pickering and R. C. Jones /in NASA. Goddard Space Flight Center Third ERTS Symp., Vol. 2 May 1974 p 41-49

CSCI 08G

Satellite imagery and other remote sensing tools and techniques have provided a powerful tool to assist geologic research; significantly increased the mapping efficiency of field geologists; shown new lineaments associated with known shear and fault zones; delineated new structural features; provided a tool to reevaluate tectonic history; helped to locate potential ground-water sources and areas of aquifer recharge; defined areas of geologic hazards; shown areas of heavy siltation in major reservoirs; and, by close interval repetition, aided in monitoring surface mine reclamation activities and the environmental protection of the intricate marshland system. The Georgia Geological Survey has been engaged in regional mapping for the new state geologic map. ERTS-1 images enlarged to compatible mapping scales have increased field geologic mapping efficiency by at least 25%. There are a number of areas where data from ERTS-1 imagery has allowed a notably higher level of precision than has been available with any amount of field work on the ground. Author

**N75-10553\*** Earth Satellite Corp., Washington, D.C.  
**AN EVALUATION OF THE SUITABILITY OF ERTS DATA FOR THE PURPOSES OF PETROLEUM EXPLORATION**  
 John R. Everett and Gerald Petzel (Eason Oil Co.) In NASA. Goddard Space Flight Center Third ERTS Symp., Vol. 2 May 1974 p 50-61  
 CSCL 08G

This investigation was undertaken to determine the types and amounts of information valuable to petroleum exploration that are extractable from ERTS data and to determine the cost of obtaining the information from ERTS relative to costs using traditional or conventional means. In particular, it was desirable to evaluate this new petroleum exploration tool in a geologically well-known area in order to assess its potential usefulness in an unknown area. In light of the current energy situation, it is felt that such an evaluation is important in order to best utilize technical efforts with customary exploration tools, by rapidly focusing attention on the most promising areas in order to reduce the time required to go through the exploration cycle and to maximize cost savings. The Anadarko Basin lies in western Oklahoma and the panhandle of Texas (Figure 1). It was chosen as a test site because there is a great deal of published information available on the surface and subsurface geology of the area, there are many known structures that act as traps for hydrocarbons, and it is similar to several other large epicontinental sedimentary basins. Author

**N75-10556\*** Ohio State Univ., Columbus.  
**AUTOMATED STRIP MINE AND RECLAMATION MAPPING FROM ERTS**  
 Wayne A. Pettyjohn, Robert H. Rogers (Bendix Corp., Ann Arbor, Mich.), and Larry E. Reed (Bendix Corp., Ann Arbor, Mich.) In NASA. Goddard Space Flight Center Third ERTS Symp., Vol. 2 May 1974 p 87-101  
 CSCL 08I

In response to the urgent need for a faster and more economical means of generating strip mine and reclamation maps, a study was conducted to evaluate the suitability of using ERTS computer compatible tape for automatic mapping. The procedure uses computer target spectral recognition techniques as a basis for classification. The area encompassed by this investigation includes five counties in eastern Ohio that comprise nearly 7,500 square kilometers (3,000 square miles). The counties have been disrupted by coal mining since the early 1800's, and strip mining has been practiced in all of them. The environmental effects of strip mining are also discussed. A.L.

**N75-10561\*** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.  
**MINERAL RESOURCES, GEOLOGICAL STRUCTURES, AND LANDFORM SURVEYS**  
 Nicholas M. Short In its Third ERTS Symp., Vol. 2 May 1974 p 147-167 refs  
 CSCL 08E

Since March 1973 there has been a shift in ERTS results in geology from the initial show-and-tell stage to a period in which scientific studies predominated, and now to an emphasis on effective applications having economic benefits and clearcut relevance to national needs. Many years will be spent on geological tasks resulting from ERTS alone; reconnaissance mapping in inaccessible regions, map revisions, regional or synoptic analysis of crustal fractures, assessment of dynamic surficial processes, systematic search for mineral wealth, use of sophisticated enhancement techniques, recognition of potential geologic hazards, and many more applications that still need to be defined. Author

**N75-10897\*** Scientific Translation Service, Santa Barbara, Calif.  
**ORBITAL GEOLOGY**  
 V. Brukhanov Washington NASA Oct. 1974 5 p Transl. into English from Izv. (Moscow), no. 173. 25 Jul. 1974 p. 2 (Contract NASw-2483)  
 (NASA-TT-F-16000) Avail: NTIS HC \$3.25 CSCL 03B

The use of satellites in space to determine geological features on the earth is analyzed and discussed with emphasis on geological advances in space technology. Author

**N75-11407\*** California Earth Science Corp., Santa Monica.  
**LINEAMENTS IN BASEMENT TERRANE OF THE PENINSULAR RANGES, SOUTHERN CALIFORNIA**  
 P. M. Merifield, Principal Investigator and D. L. Lamar 27 Sep. 1974 26 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP  
 (Contracts NAS2-7698; DI-14-08-0001-13911)  
 (E75-10003; NASA-CR-140725; TR-74-1) Avail: NTIS HC \$3.75 CSCL 08G

The author has identified the following significant results. ERTS and Skylab images reveal a number of prominent lineaments in the basement terrane of the Peninsular Ranges, Southern California. The major, well-known, active, northwest trending, right-slip faults are well displayed; northeast and west to west-northwest trending lineaments are also present. Study of large-scale airphotos followed by field investigations have shown that several of these lineaments represent previously unmapped faults. Pitches of striations on shear surfaces of the northeast and west trending faults indicate oblique slip movement; data are insufficient to determine the net-slip. These faults are restricted to the pre-tertiary basement terrane and are truncated by the major northwest trending faults. They may have been formed in response to an earlier stress system. All lineaments observed in the space photography are not due to faulting, and additional detailed geologic investigations are required to determine the nature of the unstudied lineaments, and the history and net-slip of fault-controlled lineaments.

**N75-11408\*** California Earth Science Corp., Santa Monica.  
**FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE PENINSULAR RANGES, SOUTHERN CALIFORNIA** Montly Progress Report, Nov. 1974  
 Paul M. Merifield, Principal Investigator 5 Nov. 1974 2 p EREP  
 (Contract NAS2-7698)  
 (E75-10005; NASA-CR-140727; MPR-17) Avail: NTIS HC \$3.25 CSCL 08G

**N75-11436\*** Scientific Translation Service, Santa Barbara, Calif.  
**GEOLOGICAL AND GEOPHYSICAL STUDIES FROM SPACE AND PROSPECTS FOR THEIR DEVELOPMENT**  
 G. B. Gonin, A. I. Vinogradova, B. V. Shilin, and N. A. Yakovlev In its Space Iconics (NASA-TT-F-798) Sep. 1974 p 174-181 Transl. into ENGLISH of the publ. "Kosmicheskaya Ikonika" Moscow, Nauka Press, 1973 p 147-152  
 CSCL 08G

## 04 GEOLOGY AND MINERAL RESOURCES

The possibilities of using images obtained by devices which detect the reflected and self-radiation of the the earth's surface and atmosphere in other parts of the spectrum, other than visible, were analyzed. Considered were: (1) infrared; (2) radiothermal; and (3) magnetic field. A.L.

### **N75-11437\*** Scientific Translation Service, Santa Barbara, Calif. **EXPERIENCE IN INTEGRATED GEOLOGICAL AND GEOGRAPHICAL INTERPRETATION OF SPACE PHOTOGRAPHS OBTAINED IN THE USSR**

B. V. Vinogradov and A. A. Grigoryev *In its Space Iconics* (NASA-TT-F-798) Sep. 1974 p 182-189 refs Transl. into ENGLISH of the publ. "Kosmicheskaya Ikonika" Moscow, Nauka Press, 1973 p 153-158 CSDL 14E

Two examples of regional interpretation of imagery acquired from satellite photographic and television systems are discussed. The imagery was taken aboard the Zond 7 and Kosmos satellites, and depicted: (1) sand and dust storm activity in the eastern Mediterranean Sea area; and (2) landscape and structural properties of territory of southwestern United States and northwestern Mexico. A.L.

### **N75-11438\*** Scientific Translation Service, Santa Barbara, Calif. **USE OF TV PICTURES OBTAINED FROM WEATHER SATELLITES TO STUDY THE GEOLOGICAL STRUCTURE OF THE EARTH**

I. I. Bashilova *In its Space Iconics* (NASA-TT-F-798) Sep. 1974 p 190-194 Transl. into ENGLISH of the publ. "Kosmicheskaya Ikonika" Moscow, Nauka Press, 1973 p 159-162 CSDL 08G

Results are presented of Soviet investigations into the use of television imagery obtained from meteorological satellites for the interpretation of tectonics, lithology, and structural properties of the earth. The area investigated encompassed the eastern part of Iran, and the western regions of Afghanistan and Pakistan. Interpretation of the features identified during the analysis was accomplished by comparing these features with physical, geographic, geological, and tectonic maps. It was concluded that television pictures of the earth from space can be used for geological and structural analysis. A.L.

### **N75-11458#** Bureau of Natural Gas, Washington, D.C. **OFFSHORE INVESTIGATION: PRODUCIBLE SHUT-IN LEASES AS OF JANUARY 1974, PHASE 2**

Jul. 1974 30 p Original contains color illustrations  
Avail: NTIS HC \$3.75

Estimates were made of the proved and probable gas reserves underlying the producible shut-in leases of the Louisiana and Texas Outer Continental Shelf. Data from the files of the U.S. Geological Survey and the Federal Power Commission were used. Results are summarized in tabular form. Author

### **N75-12392\*** Environmental Research Inst. of Michigan, Ann Arbor. **Infrared and Optics Div.**

**MAPPING EXPOSED SILICATE ROCK TYPES AND EXPOSED FERRIC AND FERROUS COMPOUNDS FROM A SPACE PLATFORM** Quarterly Report, 8 Jun. - 8 Sep. 1974 Frederick J. Thomson, Principal Investigator 11 Nov. 1974 3 p EREP

(Contract NAS9-13317)  
(E75-10008; NASA-CR-140658; ERIM-102000-27-L). Avail: NTIS HC \$3.25 CSDL 08B

### **N75-12416\*** Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia). Div. of Mineral Physics. **A STUDY OF THE USEFULNESS OF SKYLAB EREP DATA FOR EARTH RESOURCES STUDIES IN AUSTRALIA** Quarterly Progress Report, Aug. - Oct. 1974

K. L. Burns and J. Shepherd, Principal Investigators Oct. 1974

1 p Sponsored by NASA EREP

(E75-10047; NASA-CR-140784) Avail: NTIS HC \$3.25 CSDL 05B

### **N75-13348\*** California Earth Science Corp., Santa Monica. **ANALYSIS OF PSEUDOCOLOR TRANSFORMATIONS OF ERTS-1 IMAGES OF SOUTHERN CALIFORNIA AREA**

P. M. Merifield, Principal Investigator, D. L. Lamar, R. H. Stratton, J. V. Lamar, and Carl Gazley, Jr. Oct. 1974 27 p refs Prepared in cooperation with the RAND Corp., Santa Monica, Calif. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(Contracts NAS2-7698; DI-14-08-0001-13911)  
(E75-10037; NASA-CR-140774; TR-74-2) Avail: NTIS HC \$3.75 CSDL 05B

The author has identified the following significant results. Representative faults and lineaments, natural features on the Mojave Desert, and cultural features of the southern California area were studied on ERTS-1 images. The relative appearances of the features were compared on a band 4 and 5 subtraction image, its pseudocolor transformation, and pseudocolor images of bands 4, 5, and 7. Selected features were also evaluated in a test given students at the University of California, Los Angeles. Observations and the test revealed no significant improvement in the ability to detect and locate faults and lineaments on the pseudocolor transformations. With the exception of dry lake surfaces, no enhancement of the features studied was observed on the bands 4 and 5 subtraction images. Geologic and geographic features characterized by minor tonal differences on relatively flat surfaces were enhanced on some of the pseudocolor images.

### **N75-13351\*** Geological Survey, Denver, Colo. **REMOTE SENSING GEOPHYSICS FROM SKYLAB** Monthly Report, Oct. 1974

Kenneth Watson, Principal Investigator and H. A. Pohn Oct. 1974 2 p EREP

(NASA Order T-6555-B)  
(E75-10051; NASA-CR-140953) Avail: NTIS HC \$3.25 CSDL 08G

### **N75-13354\*** Geological Survey, Denver, Colo. **APPLICATION OF SKYLAB EREP PHOTOGRAPHS TO STUDY OF THE MODERN EPISODE OF ACCELERATED EROSION IN SOUTHERN ARIZONA** Progress Report, 1 Jan. - 30 Jun. 1974

Roger B. Morrison, Principal Investigator 1 Jul. 1974 12 p EREP

(NASA Order T-4113-B)  
(E75-10054; NASA-CR-140962) Avail: NTIS HC \$3.25 CSDL 08M

The author has identified the following significant results. Indexing and analysis of the SL 2, SL 3, and SL 4 photos of the project area has shown that S-190A coverage with less than 30% clouds totals about 123,000 sq km. The 70-mm unenlarged color, color-infrared, B/W red, and B/W green bands from S-190A are of good to excellent quality; the B/W IR bands from SL 2 are excessively grainy and have very low resolution; those from SL 3 are better but nevertheless have low resolution. The 5-inch unenlarged color transparencies from S-190B are generally of excellent photographic quality. However, where cloud cover is extensive, commonly the S-190A and S-190B color and color-IR photos are correctly exposed for the clouds but considerably underexposed for the ground. The 4X enlargements of all bands of S-190A photos taken by SL 2 are much fuzzier than they should be; evidently the enlarger was not focused properly. The 4X enlargements from SL 3 are much superior.

**N75-13355\*#** Geological Survey, Denver, Colo.  
**APPLICATIONS OF SKYLAB EREP PHOTOGRAPHS TO MAPPING OF LANDFORMS AND ENVIRONMENTAL GEOLOGY IN THE GREAT PLAINS AND MIDWEST Progress Report, 1 Jan. - 30 Jun. 1974**

Roger B. Morrison, Principal Investigator 1 Jul. 1974 32 p EREP

(NASA Order T-4647-B)

(E75-10055; NASA-CR-140963) Avail: NTIS HC \$3.75 CSCL 08B

The author has identified the following significant results. The utility of Skylab 2 and 3 S-190A multispectral photos for environmental-geologic/geomorphic applications is being tested by using them to prepare 1:250,000-scale maps of geomorphic features, surficial geology, geologic linear features, and soil associations of large, representative parts of the Great Plains and Midwest. Parts of Nebraska, Iowa, Missouri, and South Dakota were mapped. The maps were prepared primarily by interpretation of the S-190A photos, supplemented by information from topographic, geologic, and soil maps and reports. The color band provides the greatest information on geology, soils, and geomorphology; its resolution also is the best of all the multispectral bands and permits maximum detail of mapping. The color-IR band shows well the differences in soil drainage and moisture, and vegetative types, but has only moderate resolution. The B/W-red band is superior for topographic detail and stream alignments. The B/W-infrared bands best show differences in soil moisture and drainage but have poor resolution, especially those from SL 2. The B/W-green band generally is so low contrast and degraded by haze as to be nearly useless. Where stereoscopic coverage is provided, interpretation and mapping are done most efficiently using a Kern PG-2 stereoplottor.

**N75-13357\*#** Geological Survey, Denver, Colo.  
**REMOTE SENSING GEOPHYSICS FROM SKYLAB Monthly Report, Jul. 1974**

Kenneth Watson, Principal Investigator and H. A. Pohn Jul. 1974 2 p EREP

(NASA Order T-6555-B)

(E75-10057; NASA-CR-140965) Avail: NTIS HC \$3.25 CSCL 08E

**N75-13358\*#** Geological Survey, Denver, Colo.  
**REMOTE SENSING GEOPHYSICS FROM SKYLAB Monthly Report, Aug. 1974**

Kenneth Watson, Principal Investigator and H. A. Pohn Aug. 1974 2 p EREP

(NASA Order T-6555-B)

(E75-10058; NASA-CR-140966) Avail: NTIS HC \$3.25 CSCL 08E

**N75-13360\*#** Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.  
**PRELIMINARY RESULTS IN THE COMPARISON OF SKYLAB, ERTS AND RB-57 IMAGES FOR THE DETECTION OF LINEAMENTS AND FRACTURES IN PRECAMBRIAN, PALEOZOIC, AND LATE TERTIARY ROCKS ON AND NEAR THE COLORADO PLATEAU, NORTH-CENTRAL ARIZONA Progress Report**

A. F. H. Goetz, Principal Investigator, William D. DiPaolo, and Donald P. Elston 12 Dec. 1974 7 p EREP

(E75-10060; NASA-CR-141000) Avail: NTIS HC \$3.25 CSCL 08G

**N75-14183\*#** Consiglio Nazionale delle Ricerche, Milan (Italy).  
 Lab. per la Geofisica della Litosfera.  
**CONTRIBUTION OF SPACE PLATFORMS TO A GROUND**

**AND AIRBORNE REMOTE SENSING PROGRAMME OVER ACTIVE ITALIAN VOLCANOES**

R. Cassinis, Principal Investigator, G. M. Lechi, C. M. Marino, and A. M. Tonelli 5 Nov. 1974 41 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 EREP

(E75-10069; NASA-CR-141102) Avail: NTIS HC \$3.75 CSCL 08F

The author has identified the following significant results. A method has been suggested for the forecasting of the lateral eruptions of Mount Etna, through the multispectral analysis of the vegetation behavior. Unknown geological lineaments which seem to be related to deep crustal movements have been discovered using the ERTS-1 imagery. Results in the geological field were obtained in the study of the general structure of the Alpine range. In the field of official vegetation classification, ERTS-1 images were used for a preliminary study of rice fields in northern Italy. Very good experimental results have been obtained using the Skylab multispectral photographs. In the field of hydrogeology and soil type discrimination discoveries of unknown paleosol beds have been made in the northeastern part of the Po Valley using the multispectral imagery of SL3. The superior resolution of Skylab was a fundamental element for the success of this investigation.

**N75-14190\*#** Colorado School of Mines, Golden. Dept. of Geology.

**GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA Monthly Progress Report, Nov. 1974**  
 Keenan Lee, Principal Investigator 19 Dec. 1974 5 p EREP (Contract NAS9-13394)

(E75-10071; NASA-CR-141100) Avail: NTIS HC \$3.25 CSCL 08G

**N75-14191\*#** Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

**AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES Monthly Progress Report, Nov. 1974**

Roger M. Hoffer, Principal Investigator Nov. 1974 4 p EREP (Contract NAS9-13380)

(E75-10072; NASA-CR-141099) Avail: NTIS HC \$3.25 CSCL 05B

The author has identified the following significant results. The utility of the middle infrared portion of the spectrum for snow cover mapping has been demonstrated. Also, the S-192 thermal band seems to have a higher thermal detectivity than previously estimated and predicted.

**N75-14195\*#** Nevada Univ., Reno. Mackay School of Mines.

**THE GREAT BASIN INVESTIGATION Monthly Progress Report, Nov. 1974**

Jack G. Quade, Principal Investigator Nov. 1974 2 p EREP (Contract NAS9-13274)

(E75-10076; NASA-CR-141095) Avail: NTIS HC \$3.25 CSCL 08E

**N75-14237** Milan Univ. (Italy). Inst. of Mineralogy.  
**GEOLOGICAL FEATURES ON ERTS-1 IMAGES OF A TEST AREA IN THE WEST-CENTRAL ALPS**

A. Boriani, C. M. Marino, and R. Sacchi (Turin Univ.) In ESRO

## 04 GEOLOGY AND MINERAL RESOURCES

European Earth Resources Satellite Expts. May 1974 p 199-204 refs

A geologic approach was made to the definition of the capability of ERTS-1 to enhance the main geologic characteristics of some typical areas of the Alps. The area examined in the first stage of this research is in the west-central Alps region around some of the main Italian lakes (Orta, Maggiore, Como). A certain number of geologic lineaments were enhanced. Their comparison with previous geologic data shows a very interesting peculiarity: almost all the lineaments discovered are vertical faults. In order to evaluate the findings properly, many ground surveys were performed along the observed lineaments. Some of the most interesting discoveries concern the well-known Insubric Line. Some conclusions can be drawn regarding the ability of ERTS-1 type satellites to assist tectonic or general geologic studies in areas which in the past have only been studied in great detail in a traditional way. Author (ESRO)

**N75-14238** Zentralstelle fuer Geo-Photogrammetrie und Fernerkundung, Munich (West Germany).

### GEOLOGIC EVALUATION OF CENTRAL ITALY FROM ERTS-1 AND SKYLAB DATA

J. Bodechtel, J. Nithack, and R. Haydn. In ESRO European Earth Resources Satellite Expts. May 1974 p 205-215 refs

Utilizing ERTS-1 and Skylab imagery, linear features of the Apennines were enhanced by conventional photogeologic methods and by optical processing techniques using a coherent light source. Horizontal and vertical faults of regional dimensions could be detected. On the basis of fieldwork and aerial photointerpretation, the lineations revealed by ERTS data could be interpreted as ac, bc and shearing faults of an older rectangular system, and of a younger system. A difference in the direction of the b-axis is explained as caused by a clockwise rotation of larger blocks, whereas the causal main stress remained stable in a southwest-northeast direction. Overthrusts in the Umbrian Apennines and the triangular shape of the Po Valley are explained by the clockwise rotation. The transform faults bordering the blocks of the Northern Apennines, the Tuscan-Umbrian Apennines and the Abruzzi Mountains could be shearing faults due to this main stress. Author (ESRO)

**N75-14240** Bureau de Recherches Geologiques et Minieres, Orleans (France).

### ERTS IMAGE CONTRIBUTION TO GEOLOGICAL KNOWLEDGE COVERING DIFFERENT TYPES OF CLIMATES (FRANCE, TOGO, DAHOMEY, MADAGASCAR) [CONTRIBUTION DES IMAGES ERTS A LA CONNAISSANCE GEOLOGIQUE SOUS DIFFERENTS TYPES DE CLIMATS (FRANCE, TOGO, DAHOMEY, MADAGASCAR)]

M. Koch, J. Y. Scanvic, and G. Weecksteen. In ESRO European Earth Resources Satellite Expts. May 1974 p 231-241 In FRENCH; ENGLISH summary

Possibilities of using ERTS images of several climatological areas were enabled by the choice of three test areas, situated in temperate, tropical and subdesert regions, respectively, with or without a laterite cover. Whereas the subdesert climate favored the observation of outcrop formations and hence facilitated its interpretation, as was expected, a large number of indirect criteria highlight structural elements or some lithological units in temperature region. Author (ESRO)

**N75-14244** Institut Geographique National, Paris (France). **COMPARISON OF VARIOUS NUMERICAL TECHNIQUES FOR CLASSIFICATION OF MULTISPECTRAL DATA. APPLICATION TO GEOLOGY [COMPARAISON DE DIFFERENTES TECHNIQUES NUMERIQUES SERVANT A LA CLASSIFICATION DES DONNEES MULTISPECTRALES. APPLICATION A LA GEOLOGIE]**

F. Brun, A. Fontanel (Inst. Franc. du Petrole, Paris), C. Lallemand (Inst. Franc. du Petrole, Paris), G. Legendre (Inst. Franc. du Petrole, Paris), J. C. Rivereau (Inst. Franc. du Petrole, Paris), and G. Thomas (Inst. Franc. du Petrole, Paris) In ESRO European

Earth Resources Satellite Expts. May 1974 p 303-316 refs In FRENCH; ENGLISH summary Original contains color illustrations

Numerical computation was used to distinguish and map various terrains, highways, rivers, etc...on ERTS image taken on 6 October 1972 over the Rhone Valley (France). For this purpose three numerical techniques were used: (1) discriminatory analysis (supervised technique) for which it is necessary to define and delineate characteristic zones from which the identification algorithms are calculated; (2) principal component analysis (unsupervised technique) for which the different classes are obtained directly by computation; (3) adaptive analysis technique which is easier to implement than the two preceding techniques: on the one hand only selected zones are automatically mapped with the computer and on the other hand the delineation of the corresponding test sites (training areas) is not needed. These three techniques were tested on the same area (1500 sq km) and the results compared with vegetation and geological maps. Author (ESRO)

**N75-15103\*** Wolf Research and Development Corp., Pocomoke City, Md.

### APPLICABILITY OF SKYLAB REMOTE SENSING FOR DETECTION AND MONITORING OF SURFACE MINING ACTIVITIES Quarterly Progress Report, 1 Oct. - 31 Dec. 1974

R. L. Brooks, Principal Investigator and J. D. Pennewell Jan. 1975 8 p EREP

(Contract NAS9-13310)

(E75-10085; NASA-CR-141149; QPR-4) Avail: NTIS HC \$3.25 CSCL 081

**N75-15106\*** Stanford Univ., Calif. School of Earth Sciences.

### FEASIBILITY OF USING S-191 INFRARED SPECTRA FOR GEOLOGICAL STUDIES FROM SPACE Monthly Reports, 1 Jul. - 30 Nov. 1974

J. P. Lyon and F. R. Honey, Principal Investigators 30 Nov. 1974 3 p EREP

(Contract NAS9-13357)

(E75-10088; NASA-CR-141152; MR-12; MR-13; MR-14;

MR-15; MR-16) Avail: NTIS HC \$3.25 CSCL 08G

**N75-15107\*** Stanford Univ., Calif. School of Earth Sciences.

### FEASIBILITY OF USING S-191 INFRARED SPECTRA FOR GEOLOGICAL STUDIES FROM SPACE Monthly Report, Dec. 1974

J. P. Lyon and F. R. Honey, Principal Investigators 30 Dec. 1974 3 p EREP

(Contract NAS9-13357)

(E75-10089; NASA-CR-141153; MR-17) Avail: NTIS HC \$3.25 CSCL 08G

**N75-15120\*** Nevada Univ., Reno. Mackay School of Mines.

### THE GREAT BASIN INVESTIGATION Monthly Progress Report, Dec. 1974

Jack G. Quade, Principal Investigator Dec. 1974 2 p EREP (Contract NAS9-13274)

(E75-10102; NASA-CR-141298) Avail: NTIS HC \$3.25 CSCL 08G

**N75-15124\*#** California Earth Science Corp., Santa Monica.  
**FAULT TECTONICS AND EARTHQUAKE HAZARDS IN THE  
 PENINSULAR RANGES, SOUTHERN CALIFORNIA** Monthly  
 Progress Report, Dec. 1974

Paul M. Merifield, Principal Investigator 5 Jan. 1975 2 p  
 EREP

(Contract NAS2-7698)

(E75-10108; NASA-CR-140898; MPR-19) Avail: NTIS  
 HC \$3.25 CSCL 08G

**N75-15132\*#** National Aeronautics and Space Administration.  
 Goddard Space Flight Center, Greenbelt, Md.

**GEOLOGIC STRUCTURE IN CALIFORNIA: THREE STUDIES  
 WITH ERTS-1 IMAGERY**

Paul D. Lowman, Jr. Nov. 1974 23 p refs Submitted for  
 publication

(NASA-TM-X-70799; X-922-74-314) Avail: NTIS HC \$3.25  
 CSCL 08G

Results are presented of three early applications of imagery  
 from the NASA Earth Resources Technology Satellite to geologic  
 studies in California. In the Coast Ranges near Monterey Bay,  
 numerous linear drainage features possibly indicating unmapped  
 fracture zones were mapped within one week after launch of  
 the satellite. A similar study of the Sierra Nevada near Lake  
 Tahoe revealed many drainage features probably formed along  
 unmapped joint or faults in granitic rocks. The third study, in  
 the Peninsular Ranges, confirmed existence of several major faults  
 not shown on published maps. One of these, in the Sawtooth  
 Range, crosses in Elsinore fault without lateral offset; associated  
 Mid-Cretaceous structures have also been traced continuously  
 across the fault without offset. It therefore appears that  
 displacement along the Elsinore fault has been primarily of a  
 dip-slip nature, at least in this area, despite evidence for lateral  
 displacement elsewhere. Author

**N75-15133\*#** National Aeronautics and Space Administration.  
 Goddard Space Flight Center, Greenbelt, Md.

**A DEMONSTRATION OF ERTS-1 ANALOG AND DIGITAL  
 TECHNIQUES APPLIED TO STRIP MINING IN MARYLAND  
 AND WEST VIRGINIA**

Arthur T. Anderson and Jane Schubert Nov. 1974 19 p refs  
 Submitted for publication

(NASA-TM-X-70798; X-923-74-313) Avail: NTIS HC \$3.25  
 CSCL 08I

The largest contour strip mining operations in western  
 Maryland and West Virginia are located within the Georges Creek  
 and the Upper Potomac Basins. These two coal basins lie within  
 the Georges Creek (Wellersburg) syncline. The disturbed strip  
 mine areas were delineated with the surrounding geological and  
 vegetation features using ERTS-1 data in both analog (imagery)  
 and digital form. The two digital systems used were: (1) the  
 ERTS-Analysis system, a point-by-point digital analysis of  
 spectral signatures based on known spectral values, and (2) the  
 LARS Automatic Data Processing System. The digital techniques  
 being developed will later be incorporated into a data base for  
 land use planning. These two systems aided in efforts to determine  
 the extent and state of strip mining in this region. Aircraft data,  
 ground verification information, and geological field studies also  
 aided in the application of ERTS-1 imagery to perform an  
 integrated analysis that assessed the adverse effects of strip  
 mining. The results indicated that ERTS can both monitor and  
 map the extent of strip mining to determine immediately the  
 acreage affected and indicate where future reclamation and  
 revegetation may be necessary. Author



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## 05

## OCEANOGRAPHY AND MARINE RESOURCES

Includes sea-surface temperature, ocean bottom surveying imagery, drift rates, sea ice and icebergs, sea state, fish location.

**A75-10644 \* #** The detection by ERTS-1 of wind-induced ocean surface features in the lee of the Antilles Islands. R. Cram and K. Hanson (Miami, University, Coral Gables, Fla.). *Journal of Physical Oceanography*, vol. 4, Oct. 1974, p. 594-600. 8 refs. Contract No. NOAA-04-30-2212. NASA Order S-70246-AG-1.

Photographic data received from the ERTS-1 satellite over the Lesser Antilles Islands show distinct ocean features on the leeward side of each island. Attempts to relate these features to ocean eddy formations with the aid of ground truth data proved unsuccessful. However, surface and upper air wind data indicate a good correlation with the size, shape, and downwind extent of the ocean features. Studies to date indicate strongly that these features result from horizontal differences in a sea surface roughness due to the wind-shadow effect of the islands. The results suggest that horizontal variations in the reflectance of the sea surface will make remote sensing of the ocean mixed layer more difficult than previously anticipated. The surface reflection seems to be large enough to mask the smaller variations in backscattered energy from the mixed layer. Efforts to limit the effect of surface reflectance by photographic differencing of two multi-spectral scanner bands were unsuccessful. (Author)

**A75-10645 #** A satellite-aircraft thermal study of the upwelled waters off Spanish Sahara. P. E. La Violette (U.S. Department of Defense, Naval Oceanographic Office, Washington, D.C.). *Journal of Physical Oceanography*, vol. 4, Oct. 1974, p. 676-684. 10 refs. DOD-Navy-sponsored research.

Review of the upwelling along the coast of Spanish Sahara and of several associated thermal features observed in a satellite-aircraft oceanographic survey conducted during the period from the 18th through the 26th of August 1973. Analyses of the aircraft and satellite radiation data show that these features consisted of variable cool and warm eddies which extended more than 100 km northwest from the coastal upwelling zone. These features may represent a periodic occurrence. M.V.E.

**A75-11255 \*** Satellite photography of eddies in the gulf loop current. G. A. Maul (NOAA, Physical Oceanography Laboratory, Miami, Fla.), D. R. Norris (NASA, Johnson Space Center, Earth Observations Div., Houston, Tex.), and W. R. Johnson (Lockheed Electronics Co., Inc., Houston, Tex.). *Geophysical Research Letters*, vol. 1, Oct. 1974, p. 256-258. 9 refs.

Cyclonic ocean eddies, approximately 12 to 32 kilometers in diameter, have been photographed in the eastern Gulf of Mexico by SKYLAB. Apparently caused by horizon velocity shear, these features are associated with the Gulf Loop Current, whose position was known a fortnight before and after the observation. The eddies were discovered in sunlight-enhanced patterns of streamlines on the surface, and appear to be embedded in the flow. (Author)

**A75-12034 \* #** Skylab and ERTS-1 investigations of coastal land-use and water properties in Delaware Bay. V. Klemas, D. Bartlett (Delaware, University, Newark, Del.), and R. Rogers (Bendix Corp., Aerospace Systems Div., Ann Arbor, Mich.). *American Institute of Aeronautics and Astronautics and American Geophysical Union, Conference on Scientific Experiments of Skylab, Huntsville,*

*Ala., Oct. 30-Nov. 1, 1974, AIAA Paper 74-1220.* 10 p. 10 refs. Contracts No. NAS5-21837; No. NAS1-12304; No. N00014-69-A-0407.

Study of coastal land use and water properties of Delaware Bay using digital and visual analysis of enhanced imagery from NASA's Earth Resources Technology Satellite (ERTS) and from the Skylab Earth Resources Experimental Package (EREP). ERTS is shown to have the advantage of repetitive coverage of the test site which facilitates change detection experiments by gathering data under a variety of tidal, seasonal, and atmospheric conditions. Skylab-EREP data, on the other hand, are superior in both spatial and spectral resolution. M.V.E.

**A75-12719 #** Monitoring and predicting El Niño invasions. W. H. Quinn (Oregon State University, Corvallis, Ore.). *Journal of Applied Meteorology*, vol. 13, Oct. 1974, p. 825-830. 12 refs. Navy-supported research; NSF Grants No. GA-1571; No. GA-27205.

El Niño refers to the anomalously warm surface water invasion along the southern Ecuadorian and Peruvian coastal regions which are usually under the influence of cooler waters from coastal upwelling and the northward flowing Peru Current. Southern Oscillation indices (differences in sea level atmospheric pressure between Easter Island and Darwin, Australia, and between Juan Fernandez Island and Darwin) were treated so as to emphasize interannual changes, and considered for monitoring unusual equatorial Pacific ocean-atmosphere developments and certain of their consequences (e.g., El Niño invasions). It now appears that their trends can be used to predict activity of El Niño intensity several months in advance. F.R.L.

**A75-15179 #** The wind vector in a layer over water (O vektore vetra v privodnom sloe). E. K. Korchagin, R. N. Semenov, and I. A. Mandurovskii. *Meteorologiya i Gidrologiya*, Oct. 1974, p. 41-48. 8 refs. In Russian.

The horizontal component of the wind vector over the sea was determined from an aircraft at various altitudes from 100 to 1000 m. A Doppler radar for measuring ground speed and drift angle, an airspeed sensor, and a course selector were used. The surface-wind parameters were determined from aerial photographs of the sea surface and from calculations with respect to the atmospheric pressure field. The statistical relationship found between the surface-wind vector and the vector determined on board the aircraft supports the possibility of finding surface-wind and water-surface parameters from aircraft flying at altitudes up to 1000 m, and of extrapolating ship-borne observations of the wind vector to altitudes in the friction layer. A.T.S.

**A75-17120 #** A study of microwave emission properties of sea ice - AIDJEX 1972. D. C. Meeks (Aerojet ElectroSystems Co., Azusa, Calif.), R. O. Ramseier (Department of the Environment, Ottawa, Canada), and W. J. Campbell (U.S. Geological Survey, Tacoma, Wash.). In: *International Symposium on Remote Sensing of Environment*, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 307-322. 8 refs.

Results derived from a comparative study of surface-based 13.4 GHz passive microwave measurements with detailed surface-truth measurements concerning the physical, chemical and structural properties of Arctic sea ice illustrate distinct decreasing microwave emissions for first-year, transitional and multi-year sea ice types. For transitional and multi-year ice, a structural relationship for microwave emissions by sea ice exists. Both vertically and horizontally polarized measured brightness temperatures decrease linearly with increasing average ice porosity. In the case of first-year ice, however, measured brightness temperatures are comparatively uniform and microwave emission appears to be more strongly influenced by high near-surface salinity concentrations combined with the occurrence of uniform porosity. (Author)

## 05 OCEANOGRAPHY AND MARINE RESOURCES

**A75-17121 \* #** Investigation of radar discrimination of sea ice. S. K. Parashar, A. W. Biggs, A. K. Fung, and R. K. Moore (University of Kansas Center for Research, Inc., Lawrence, Kan.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 323-332. 15 refs. Research supported by the University of Kansas; Contracts No. NAS9-10261; No. N60921-70-C-0221.

The ability of radar to discriminate sea ice types and their thickness was studied. Radar backscatter measurements at 400 MHz (multi-polarization) and 13.3 GHz (VV polarization) obtained from NASA Earth Resources Aircraft Program Mission 126 were analyzed in detail. The scatterometer data were separated into seven categories of sea ice according to age and thickness as interpreted from stereo aerial photographs. The variations of radar backscatter cross-section with sea ice thickness at various angles are presented at the two frequencies. There is a reversal of angular character of radar return from sea ice less than 18 cm thick at the two frequencies. Multi-year ice (sea ice greater than 180 cm thick) gives strongest return at 13.3 GHz. First-year ice (30 cm to 90 cm thick) gives strongest return at 400 MHz. Open water can be differentiated at both the frequencies. Four-polarization 16.5 GHz radar imagery was also obtained. Open water and three categories of sea ice can be identified on the images. The results of the imagery analysis are consistent with the radar scatterometer results. (Author)

**A75-17177 \* #** Computer derived coastal water classifications via spectral signatures. D. K. Clark, J. B. Zaitzeff, L. V. Strees, and W. S. Glidden (NOAA, National Environmental Satellite Service, Washington, D.C.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1213-1239. 9 refs. NASA-NOAA-supported research.

In April 1973, the National Environmental Satellite Service conducted a remote sensing investigation within the coastal waters of the New York Bight. Remote sensor records acquired from the ERTS-1 Multispectral Scanner and the Bendix 24 Channel Multispectral Scanner records flown on the NASA C-130 were used for water mass classification. Computer-derived classifications are discussed and compared. Such features as the Hudson River's turbid discharge plumes, acid waste and shelf water are examined in terms of their distribution of suspended particulates (2-203 microns), transmissivity, diffuse attenuation, incident and returned spectral irradiances. The characteristics of these features and their relationship to the computer derived classifications are presented and discussed with respect to radiative transfer theory. (Author)

**A75-17183 \* #** Ocean internal waves off the North American and African coasts from ERTS-1. J. R. Apel, R. L. Charnell (NOAA, Atlantic Oceanographic and Meteorological Laboratories, Miami, Fla.), and R. J. Blackwell (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1345-1351. ARPA-sponsored research.

**A75-17184 #** Lake Ontario water mass delineation from ERTS-1. J. C. Munday, Jr. (Erindale College, Clarkson, Ontario, Canada). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1355-1368. 18 refs. Department of Supply and Services Contracts No. 01GRKW111-2-1073; No. 0GR2-0522.

Multiband analysis of ERTS-1 MSS photographic images of western Lake Ontario has been conducted to delineate water masses.

Modification of water hues by thin cloud cover is detected by chromaticity analysis. Density-sliced MSS 5 images indicate suspended sediment plumes near river and harbor mouths and in near-shore zones, and discoloration in scattered other areas. High percentage cloud cover necessitates a long-term ERTS mapping project to obtain a useful satellite picture of Lake Ontario circulation dynamics. (Author)

**A75-17203 #** Measurement of sea surface currents using airborne Doppler radar and inertial navigation systems. J. F. R. Gower (Environment Canada, Marine Sciences Directorate, Victoria, British Columbia, Canada). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1657-1667.

**A75-17233 #** Application of ERTS-1 data to the protection and management of New Jersey's coastal environment. R. L. Mairs, R. T. Macomber, D. T. Stanczuk, F. J. Wobber, L. R. Pettinger (Earth Satellite Corp., Washington, D.C.), R. S. Yunghans, E. B. Feinberg, and J. Stitt (New Jersey Department of Environmental Protection, Trenton, N.J.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 2087-2091.

**A75-17479** Pacific range electromagnetic signature studies /Project PRESS/. W. S. Hahn (RCA, Missile and Surface Radar Div., Moorestown, N.J.). *RCA Engineer*, vol. 20, Oct.-Nov. 1974, p. 60-63.

The activities of the Pacific range electromagnetic signature studies (PRESS) program including mission planning, test execution, data reduction and analysis, and the development of radar for sensor systems are reviewed. The paper discusses the roles of the PRESS program which are (1) to provide metric and signature data in test reentry vehicles, and (2) to act as a radar development test bed. Certain features of the sensors and related systems in the PRESS program are summarized. T.S.

**A75-18124 #** The gravity field and the definition of stationary sea surface topography. R. S. Mather (New South Wales, University, Kensington, Australia). In: Geodesy and physics of the earth; Proceedings of the Second International Symposium, Potsdam, East Germany, May 7-11, 1973. Part 2. Potsdam, East Germany, Deutsche Akademie der Wissenschaften, Zentralinstitut für Physik der Erde, 1974, p. 381-414. 21 refs.

The investigation reported shows that for the intended investigation of ocean circulation it is necessary to determine accurately the instantaneous geocentric position of the spacecraft carrying the altimeter used in the study. The criteria required in the definition of the global gravity anomaly field are discussed along with the determination of the features of the ocean geoid. G.R.

**N75-10529\*#** National Oceanic and Atmospheric Administration, Miami, Fla.

**REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Progress Report, Sep. 1974**  
George A. Maul, Principal Investigator Sep. 1974 2 p EREP (NASA Order T-4713-B)  
(E74-10801; NASA-CR-140495) Avail: NTIS HC \$3.25 CSCL 08C

**N75-10554\*** Corps of Engineers, Washington, D.C.  
**ERTS PROGRAM OF THE US ARMY CORPS OF ENGINEERS**

Jack W. Jarman /In NASA. Goddard Space Flight Center Third

ERTS Symp., Vol. 2 May 1974 p 62-75

# CSCL 08E

The Army Corps of Engineers research and development efforts associated with the ERTS Program are confined to applications of investigation, design, construction, operation, and maintenance of water resource projects. Problems investigated covered: (1) resource inventory; (2) environmental impact; (3) pollution monitoring; (4) water circulation; (5) sediment transport; (6) data collection systems; (7) engineering; and (8) model verification. These problem areas were investigated in relation to bays, reservoirs, lakes, rivers, coasts, and regions. ERTS-1 imagery has been extremely valuable in developing techniques and is now being used in everyday applications. A.L.

**N75-10565\*** National Oceanic and Atmospheric Administration, Washington, D.C.

## A REVIEW OF INITIAL INVESTIGATIONS TO UTILIZE ERTS-1 DATA IN DETERMINING THE AVAILABILITY AND DISTRIBUTION OF LIVING MARINE RESOURCES

William H. Stevenson (NOAA, Bay St. Louis, Mo.), Andrew J. Kemmerer, Buddy H. Atwell (NASA, Mississippi Test Facility), and Paul M. Maughan (Earth Satellite Corp.) In NASA, Goddard Space Flight Center Third ERTS Symp., Vol. 2 May 1974 p 76-86 refs

CSCL 08A

The National Marine Fisheries Service has been studying the application of aerospace remote sensing to fisheries management and utilization for many years. The 15-month ERTS study began in July 1972 to: (1) determine the reliability of satellite and high altitude sensors to provide oceanographic parameters in coastal waters; (2) demonstrate the use of remotely-sensed oceanographic information to predict the distribution and abundance of adult menhaden; and (3) demonstrate the potential use of satellites for acquiring information for improving the harvest and management of fisheries resources. The study focused on a coastal area in the north-central portion of the Gulf of Mexico, including parts of Alabama, Mississippi, and Louisiana. The test area used in the final analysis was the Mississippi Sound and the area outside the barrier islands to approximately the 18-meter (10-fathom) curve. Author

**N75-10559\*** National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

## WATER RESOURCES

Vincent V. Salomonson In its Third ERTS Symp., Vol. 2 May 1974 p 126-137

CSCL 08H

ERTS-1 applications in snow and ice monitoring, surface water monitoring, including monitoring of wetland areas and flood inundated area mapping, and also watershed monitoring for runoff prediction are discussed. Results also indicate that geological features can be noted which relate to ground water. ERTS-1 data can be used successfully in operational situations by water resources management agencies. Author

## N75-10566\*# Virginia Inst. of Marine Science, Gloucester Point. REMOTE SENSING APPLICATIONS IN MARINE SCIENCE PROGRAMS AT VIMS

Hayden H. Gordon, Michael E. Penney, and Robert J. Byrne [1974] 86 p refs

(Contract NAS6-1902)

(NASA-CR-137475) Avail: NTIS HC \$4.75 CSCL 14B

Scientists at the Virginia Institute of Marine Science (VIMS) utilized remote sensing in three programs: (1) tonal variations in imagery of wetlands; (2) use of the thermal infrared to delineate the discharge cooling water at the Virginia Electric and Power Company (VEPCO) nuclear power station on the James River; and (3) the use of aerial photography to determine the volume storage function for water in the marsh-bay complex fed by Wachapreague Inlet on the Eastern Shore of Virginia. Details of the investigations are given, along with significant results. Author

**N75-10571\*#** Chesapeake Research Consortium, Inc., Baltimore, Md.

## A SURVEY FOR THE USE OF REMOTE SENSING IN THE CHESAPEAKE BAY REGION

Robert E. Ulanowicz (Maryland Univ.) Jun. 1974 93 p

(Contract NAS6-2433)

(NASA-CR-137476; CRC-Publ-6) Avail: NTIS HC \$4.75 CSCL 08B

Environmental problem areas concerning the Chesapeake Bay region are reviewed along with ongoing remote sensing programs pertaining to these problems, and recommendations are presented to help fill lacunae in present research and to utilize the remote sensing capabilities of NASA to their fullest. A list of interested organizations and individuals is presented for each category. The development of technologies to monitor dissolved nutrients in bay waters, the initiation of a census of the disappearing rooted aquatic plants in the littoral zones, and the mapping of natural building constraints in the growth regions of the states of Maryland and Virginia are among the recommendations presented. Author

**N75-10671\*#** Battelle Columbus Labs., Ohio.

## INTERACTION OF MARINE GEODESY, SATELLITE TECHNOLOGY AND OCEAN PHYSICS

A. G. Mourad and D. M. J. Fubara Jun. 1972 105 p refs

(Contract NAS6-2006)

(NASA-CR-137470) Avail: NTIS HC \$5.25 CSCL 08J

The possible applications of satellite technology in marine geodesy and geodetic related ocean physics were investigated. Four major problems were identified in the areas of geodesy and ocean physics: (1) geodetic positioning and control establishment; (2) sea surface topography and geoid determination; (3) geodetic applications to ocean physics; and (4) ground truth establishment. It was found that satellite technology can play a major role in their solution. For solution of the first problem, the use of satellite geodetic techniques, such as Doppler and C-band radar ranging, is demonstrated to fix the three-dimensional coordinates of marine geodetic control if multi-satellite passes are used. The second problem is shown to require the use of satellite altimetry, along with accurate knowledge of ocean dynamics parameters such as sea state, ocean tides, and mean sea level. The use of both conventional and advanced satellite techniques appeared to be necessary to solve the third and fourth problems. Author

**N75-10673\*#** Battelle Columbus Labs., Ohio.

## BISTATIC RADAR SEA STATE MONITORING

George T. Ruck, Donald E. Barrick, and Thaddeus Kaliszewski Jun. 1972 124 p refs

(Contract NAS6-2006)

(NASA-CR-137469) Avail: NTIS HC \$5.25 CSCL 08C

Bistatic radar techniques were examined for remote measurement of the two-dimensional surface wave height spectrum of the ocean. One technique operates at high frequencies (HF), 3-30 MHz, and the other at ultrahigh frequencies (UHF), approximately 1 GHz. Only a preliminary theoretical examination of the UHF technique was performed; however the principle underlying the HF technique was demonstrated experimentally with results indicating that an HF bistatic system using a surface transmitter and an orbital receiver would be capable of measuring the two-dimensional wave height spectrum in the vicinity of the transmitter. An HF bistatic system could also be used with an airborne receiver for ground truth ocean wave spectrum measurements. Preliminary system requirements and hardware configurations are discussed for both an orbital system and an aircraft verification experiment. Author

**N75-10674#** World Meteorological Organization, Geneva (Switzerland).

## REPORT OF THE MEETING ON DRIFTING BUOYS FOR THE FIRST GARP GLOBAL EXPERIMENT

Mar. 1974 91 p Conf. held at Geneva, Mar. 1974 Prepared jointly with Intern. Council for Sci. Unions

(GARP-Spec-Rept-13) Avail: NTIS HC \$4.75; WMO, Geneva

## 05 OCEANOGRAPHY AND MARINE RESOURCES

Within the framework of the first GARP global experiment, the status of the development of the buoy observing systems appropriate for the experiment is discussed. The requirements of the minimum capability of buoys for the experiment as well as the requirements for the polar orbiting system for the drifting buoy observing program are outlined. The deployment strategy, steps towards realization of the buoy system, and possible oceanographic programs during the FGGE using expendable buoys are also described. ESR0

**N75-10681#** Florida State Univ., Tallahassee.

### **THE COHO PROJECT: LIVING RESOURCES PREDICTION FEASIBILITY STUDY, VOLUME 1 Final Report**

James J. Brien, Bruce M. Woodworth, and David J. Wright 1974 37 p refs Prepared in cooperation with Oregon State Univ. (Grants NOAA-043-022-28; NSF GX-33502) (PB-234057/8; NSF/IDOE-74-18) Avail: NTIS HC\$3.25 CSCL 08C

The Coho project demonstrated a system which provides a substantial improvement in fish finding technique. It is the first known system which combines oceanographic and meteorological variables with the knowledge that certain species are temperature dependent, in order to arrive at an accurate forecast of the location of harvestable concentrations of salmon. The area chosen to test the prediction system was off the central coast of Oregon between Cape Lookout and Seal Rock. GRA

**N75-10682#** Florida State Univ., Tallahassee.

### **THE COHO PROJECT: LIVING RESOURCES PREDICTION FEASIBILITY STUDY, VOLUME 2: ENVIRONMENTAL REPORT**

James J. OBrien, Bruce M. Woodworth, and David J. Wright 1974 191 p Prepared in cooperation with Oregon State Univ. (Grants NOAA-043-022-28; NSF GX-33502) (PB-234058/6; NSF/IDOE-74-19) Avail: NTIS HC\$5.50 CSCL 06C

The Coho project was a pilot project to study the application of remote sensing techniques for the benefit of the Central Oregon offshore Coho fishery. The system, designed to provide a true daily forecast of environmental factors conducive to concentrations of harvestable stocks of Coho salmon, was operated to include the offshore area between Cape Lookout (45 deg 20.5 min N) and Seal Rock (44 deg 30 min N) along the Central Oregon coast, during the period June 15, 19 1973, to August 16, 1973. This volume contains the data on all relevant environmental factors utilized in the prediction studies. GRA

**N75-10683#** Florida State Univ., Tallahassee.

### **THE COHO PROJECT: LIVING RESOURCES PREDICTION FEASIBILITY STUDY, VOLUME 3: SYSTEM EVALUATION REPORT**

James J. OBrien, Bruce M. Woodworth, and David J. Wright 1974 64 p Prepared in cooperation with Oregon State Univ. (Grants NOAA-043-022-28; NSF GX-33502) (PB-234059/4; NSF/IDOE-74-20) Avail: NTIS HC\$3.75 CSCL 06C

The Coho salmon is known to be a temperature dependent species preferring the relatively warm waters in the 52 degrees to 56 degrees Fahrenheit range. The upwelling phenomenon, on the other hand, brings cold water into the Coho habitat thus tending to drive the fish away. The cold water, however, is laden with nutrients which stimulate the initial phases of the food chain at the top of which exists the salmon. It is to be expected, and was presumed in this study, that Coho would be found on the warmer side of the interface of the upwelled and stabilized waters. This volume is devoted to the evaluation of a pilot prediction system operating off the central Oregon coast. The economic merits along with some unfavorable comments are set forth. GRA

**N75-11411\*#** Massachusetts Univ., Gloucester. Marine Station.

### **OCEAN COLOR, A THREE COMPONENT SYSTEM?**

Charles S. Yentsch and William P. Owen 21 Sep. 1972 18 p refs

(Contract NAS5-21813)

(NASA-CR-139145) Avail: NTIS HC\$3.25 CSCL 08J

This study measures the concentrations of phytoplankton chlorophyll and yellow substance in the coastal waters of the Gulf of Maine. Sea surface observations attempt to delineate the principal biochemical parameters responsible for sea surface color. It is shown that the reddish-brown water changed to a blue-green in the open gulf. M.C.F.

**N75-12172\*#** National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

### **A SIMULATION OF SYNTHETIC APERTURE RADAR IMAGING OF OCEAN WAVES**

Calvin T. Swift 29 Oct. 1974 14 p Presented at the 1974 USNC/URSI Meeting, Boulder, Colorado, 14-17 Oct. 1974 (NASA-TM-X-72629) Avail: NTIS HC\$3.25 CSCL 17I

A simulation of radar imaging of ocean waves with synthetic aperture techniques is presented. The modelling is simplistic from the oceanographic and electromagnetic viewpoint in order to minimize the computational problems, yet reveal some of the physical problems associated with the imaging of moving ocean waves. The model assumes: (1) The radar illuminates a one-dimensional, one harmonic ocean wave. (2) The scattering is assumed to be governed by geometrical optics. (3) The radar is assumed to be down-looking, with Doppler processing (range processing is suppressed due to the one-dimensional nature of the problem). (4) The beamwidth of the antenna (or integration time) is assumed to be sufficiently narrow to restrict the specular points of the peaks and troughs of the wave. The results show that conventional processing of the image gives familiar results if the ocean waves are stationary. When the ocean wave dispersion relationship is satisfied, the image is smeared due to the motion of the specular points over the integration time. In effect, the image of the ocean is transferred to the near field of the synthetic aperture. Author

**N75-12396\*#** National Oceanic and Atmospheric Administration, Miami, Fla.

### **AN ASSESSMENT OF THE POTENTIAL CONTRIBUTIONS TO OCEANOGRAPHY FROM SKYLAB VISUAL OBSERVATIONS AND HAND-HELD PHOTOGRAPHY Monthly Progress Report, Aug. 1974**

George A. Maul, Principal Investigator and Michael McCaslin Aug. 1974 18 p EREP (NASA Order T-4713-B) (E75-10017; NASA-CR-140731) Avail: NTIS HC\$3.25 CSCL 08J

**N75-12407\*#** Wolf Research and Development Corp., Pocomoke City, Md.

### **APPLICABILITY OF SKYLAB REMOTE SENSING FOR DETECTION AND MONITORING OF SURFACE MINING ACTIVITIES Quarterly Progress Report, 1 Jul. - 30 Sep. 1974**

R. L. Brooks, Principal Investigator and J. D. Pennewell Oct. 1974 6 p EREP (Contract NAS9-13310) (E75-10038; NASA-CR-140775; QPR-4) Avail: NTIS HC\$3.25 CSCL 08I

**N75-13341\*#** National Aeronautics and Space Administration, Mississippi Test Facility, Bay Saint Louis.

### **EVALUATION OF SATELLITE REMOTE SENSING AND AUTOMATIC DATA TECHNIQUES FOR CHARACTERIZATION OF WETLANDS AND COASTAL MARSHLANDS**

Robert H. Cartmill, Principal Investigator [1974] 1 p ERTS (E75-10025; NASA-TM-X-72062) Avail: NTIS HC\$3.25 CSCL 08B

The author has identified the following significant results. ERTS digital data has been used to detect and measure accretion in the large estuarial system of the Atchafalaya River in southern Louisiana. Comparisons of aerial photography taken in October 1970 with a computer printout of ERTS digital data collected on October 1, 1972, show that in a delineated area of 1400 hectares (3460 acres) an accretion of land area in the amount of 112 hectares (277 acres) had occurred. Analysis of band 3 of the ERTS MSS was used to make a land-water map of the area. The accretion test area was marked on this map and the percentage of elements indicated as land was calculated. This percentage was then multiplied by the total test area to obtain the area of land on the date of the ERTS observation for comparison with the aerial photography. Significant improvement in classification accuracy of ERTS MSS data has been achieved by use of a priori probabilities of occurrence in pattern recognition programs. Two classifications were made with accuracies of 76.0% and 81.5%, respectively.

**N75-13496\*** Rockwell International Corp., Downey, Calif. Science Center.

**MEASUREMENTS OF THE DIELECTRIC PROPERTIES OF SEA WATER AT 1.43 GHz Final Report**

W. W. Ho, A. W. Love, and M. J. VanMelle Washington NASA Dec. 1974 39 p refs  
(Contract NAS1-10691)

(NASA-CR-2458) Avail: NTIS HC \$3.75 CSCL 08J

Salinity and temperature of water surfaces of estuaries and bay regions are determined to accuracies of 1 ppt salinity and 0.3 kelvin surface temperature. L-band and S-band radiometers are used in combination as brightness temperature detectors. The determination of the brightness temperature versus salinity, with the water surface temperature as a parameter for 1.4 GHz, is performed with a capillary tube inserted into a resonance cavity. Detailed analysis of the results indicates that the measured values are accurate to better than 0.2 percent in the electric property epsilon' and 0.4 percent in epsilon''. The calculated brightness temperature as a function of temperature and salinity is better than 0.2 kelvin. Thus it is possible to reduce the measured data obtained with the two-frequency radiometer system with 1 ppt accuracy to values in the salinity range 5 to 40 ppt.

Author

**N75-14185\*** National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs. **REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Progress Report, Oct. 1974**  
George A. Maul, Principal Investigator Oct. 1974 2 p EREP (NASA Order T-4713-B)  
(E75-10031; NASA-CR-140726) Avail: NTIS HC \$3.25 CSCL 08J

**N75-14186\*** National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs. **REMOTE SENSING OF OCEAN CURRENT BOUNDARY LAYER Monthly Progress Report, Nov. 1974**  
George A. Maul, Principal Investigator Nov. 1974 2 p EREP (NASA Order T-4713-B)  
(E75-10067; NASA-CR-141021) Avail: NTIS CSCL 08J

**N75-14228** Ecole Nationale Supérieure du Pétrole et des Monteurs, Reuil-Malmaison (France). **RECENT AND PRESENT SEDIMENTATION COMPLEXITY OF THE RHONE DELTA AND THE FRENCH MEDITERRANEAN COAST (GOLION PROJECT) [COMPLEXITE DE LA SEDIMENTATION RECENTE ET ACTUELLE DU DELTA DU RHONE ET DE LA COTE MEDITERRANEEENNE FRANCAISE (PROJET GOLION)]**

J. P. Bertrand, M. Guy, and A. L'Hommer (Bureau de Rech. Geol. et Minières, Orleans, France) In ESRO European

Earth-Resources Satellite Expts. May 1974 p 121-133 In FRENCH; ENGLISH summary Original contains color illustrations

A number of ERTS-1 images covering the geographical zone were studied and compared with cartographic maps, aerial photographs and thermal-IR images. The old and recent sediments leave traces in the landscape which are decoded by interpreting the shapes of the clear zones forming a network against the black background representing water and humid zones (MSS bands 6 and 7). Fieldwork is currently being conducted to study the corresponding sedimentary models. The comparison of ERTS images, certain thermal-IR images and information on the flow of the Rhone provided some clarification of the mechanisms associated with river dynamics regarding current sedimentation.

Author (ESRO)

**N75-14231** Ecole Nationale Supérieure des Mines, Paris (France). Centre d'Informatique Géologique.

**COLOUR COMPOSITES OF ERTS MULTISPECTRAL IMAGERY FOR APPLICATIONS IN HYDROLOGY AND OCEANOGRAPHY**

J. M. Monget In ESRO European Earth-Resources Satellite Expts. May 1974 p 151-153 Original contains color illustrations

Work was carried out aimed largely at finding the combination of false colors best suited to the monitoring of suspended matter and chlorophyll patterns. The best results were obtained off the coast of Italy, where evidence of water pollution by oil slicks was also clearly detected. On the North Sea coast, the turbid nearshore surface water distribution has been greatly enhanced, allowing good mapping of sediment transport in this area. The color composites also contain useful information regarding in-land hydrology. For example, the difference between humid and dry vegetation is clearly visible all along the North Sea coast, so that an accurate outline of the polders can be obtained.

Author (ESRO)

**N75-14234** Deutsches Hydrographisches Institut, Hamburg (West Germany).

**USE OF ERTS-1 IN SEA-ICE STUDIES**

K. Struëbing In ESRO European Earth-Resources Satellite Expts. May 1974 p 173-178 refs

Arctic and subarctic regions are presented to demonstrate the specific characteristics and advantages of ERTS-1 data. The 60-100 m resolution of the images allows very detailed and precise interpretation and mapping of even the smaller sea ice features. Making use of the differences in reflectance in the visible and near-IR bands, different ice types and development stages can be distinguished. Furthermore, a special relationship between the ice cover and its regional occurrence as shown by ERTS images is emphasized.

Author (ESRO)

**N75-14262\*** Washington Univ., Seattle. Arctic Ice Dynamics Joint Experiment Office.

**AIDJEX BULLETIN NUMBER 26**

Jul. 1974 126 p refs

(Contract NSF C-625)

(PB-235298/7; AIDJEX-74-25) Avail: NTIS HC \$5.75

A variety of articles dealing with field work and data analysis as well as pack ice modeling is presented. Articles discuss: suitability of the pack ice surface to vehicle travel; thickness and roughness variations of multiyear sea ice; determining dynamics and morphology of Beaufort Sea ice from data obtained by satellites, aircraft, and drifting stations; a climate simulation model applied to arctic pack ice; and problems of structuring large capacity computer programs. An index to all ERTS-1 photographs that are presently in the AIDJEX data bank is included.

GRA

## 05 | OCEANOGRAPHY AND MARINE RESOURCES

**N75-14793\*\*** Kansas Univ. Center for Research, Inc., Lawrence.  
Remote Sensing Lab.

### **PRELIMINARY ANALYSIS OF SKYLAB RADSCAT RESULTS OVER THE OCEAN**

R. K. Moore, J. D. Claassen, J. D. Young, W. J. Pierson, Jr.  
(City Univ. of New York), and V. J. Cardone (City Univ. of New  
York) Nov. 1974 9 p refs

(Contract NAS9-13642)

(NASA-CR-141454; RSL-TR-254-2; CUNY-43) Avail: NTIS  
HC \$3.25 CSCL 22A

Preliminary observations at 13.9 GHz of the radar backscatter  
and microwave emission from the sea were analyzed using data  
obtained by the radiometer scatterometer on Skylab. Results  
indicate approximately a square-law relationship between  
differential scattering coefficient and windspeed at angles of  
40 deg to 50 deg, after correction for directional effect, over a  
range from about 4 up to about 25 meters/sec. The brightness  
temperature response was also observed, and considerable success  
was achieved in correcting it for atmospheric attenuation and  
emission. Measurements were made in June, 1973, over  
Hurricane Ava off the west coast of Mexico and over relatively  
calm conditions in the Gulf of Mexico and Caribbean Sea.

Author

**N75-15116\*\*** National Oceanic and Atmospheric Administration,  
Miami, Fla. Atlantic Oceanographic and Meteorological Labs.  
**REMOTE SENSING OF OCEAN CURRENT BOUNDARY  
LAYER Monthly Progress Report, Dec. 1974**

George A. Maul, Principal Investigator 9 Jan. 1975 2 p  
EREP

(NASA Order T-4713-B)

(E75-10098; NASA-CR-141294) Avail: NTIS HC \$3.25 CSCL  
08J

## 06 HYDROLOGY AND WATER MANAGEMENT

Includes snow cover and water runoff in rivers and glaciers, saline intrusion, drainage analysis, geomorphology of river basins, land uses, and estuarine studies.

**A75-12873 \*** Water depth penetration film test. H. E. Lockwood, L. Perry, G. E. Sauer (Technicolor Graphics Services, Inc.), and N. T. Lamar (NASA, Johnson Space Center, Houston, Tex.). *Photogrammetric Engineering*, vol. 40, Nov. 1974, p. 1303-1314. Contract No. NAS9-11500. NASA Order HT-73.

As part of the National Aeronautics and Space Administration Earth Resources Program, a comparative and controlled evaluation of nine film-filter combinations was completed to establish the relative effectiveness in recording water subsurface detail if exposed from an aerial platform over a typical water body. The films tested, with one exception, were those which prior was suggested had potential. These included an experimental 2-layer positive color film, a 2-layer (minus blue layer) film, a normal 3-layer color film, a panchromatic black-and-white film, and a black-and-white infrared film. Selective filtration was used with all films. (Author)

**A75-13578** Can spinoffs from space provide water for a thirsty world. L. Virden (Brevard Community College, Fla.). In: *Technology today for tomorrow; Proceedings of the Eleventh Space Congress, Cocoa Beach, Fla., April 17-19, 1974. Volume 1.* Cape Canaveral, Fla., Canaveral Council of Technical Societies, 1974, p. 2-3 to 2-8. 19 refs.

This analysis of the origin of our water supply system illustrates the seriousness and complexity of our present water problems which will require all the technology acquired by space-age scientists and engineers to solve. It is intended to show that present water depends as much on water vapor in the atmosphere as on that below the crust of the earth. Spinoffs from the space program should be put to use to overcome water pollution and develop prototypes for desalting, reclaiming and recycling water. (Author)

**A75-13579** Water-management models in Florida from ERTS-1 data. A. L. Higer, E. H. Cordes (U.S. Geological Survey, Miami, Fla.), and A. E. Coker (U.S. Geological Survey, Tampa, Fla.). In: *Technology today for tomorrow; Proceedings of the Eleventh Space Congress, Cocoa Beach, Fla., April 17-19, 1974. Volume 1.* Cape Canaveral, Fla., Canaveral Council of Technical Societies, 1974, p. 3-1 to 3-12. 10 refs.

Questions concerning the water supply for southeast Florida are considered along with the ERTS-1 data which can be obtained from this area. The investigation indicates that an operational water-management model for the Everglades basin is feasible. An ecological model is designed to relate the wildlife in the Shark River Slough to the availability of food and water. A gradual reduction of water levels prior to bird rookery formation, would result in the concentration of fish in the Shark River Slough. Such a concentration of fish could ensure adequate food for successful hatches of several rare and endangered bird species. G.R.

**A75-13580 \*** Coastal wetlands - Prospects for satellite inventory. R. R. Anderson and V. Carter (American University, Washington, D.C.). In: *Technology today for tomorrow; Proceedings of the Eleventh Space Congress, Cocoa Beach, Fla., April 17-19, 1974. Volume 1.* Cape Canaveral, Fla., Canaveral Council of Technical Societies, 1974, p. 3-13 to 3-24. Contract No. NAS5-21752.

It is pointed out that coastal wetlands are among the nation's most valuable natural resources. A relatively low cost and moderately accurate method for mapping these areas would, therefore, be very attractive. It appears that such a method could be found by utilizing ERTS-1 data. Two test sites were selected for an intensive study of the feasibility of such an approach. One test area involves a salt marsh complex located at the mouth of the Chincoteague Bay in Virginia. The second area constitutes a near-saline marsh at the mouth of the Nanticoke River, Maryland. The study shows that ERTS-1 digital data provide maximum gray-level resolution for the mapping of wetland species and features. G.R.

**A75-13596** Rainfall estimations from geosynchronous satellite imagery. C. G. Griffith and W. L. Woodley (NOAA, Experimental Meteorology Laboratory, Coral Gables, Fla.). In: *Technology today for tomorrow; Proceedings of the Eleventh Space Congress, Cocoa Beach, Fla., April 17-19, 1974. Volume 2.*

Cape Canaveral, Fla., Canaveral Council of Technical Societies, 1974, p. 5-16 to 5-24. Contracts No. NOAA-25-22-0211; No. NOAA-03-3-022-18.

A method to estimate rainfall from visible geosynchronous satellite images is outlined. The two component relationships, derived from ATS-3 and WSR-57 radar data, are discussed. Calculations are made on two days with this method and compared with ground truth rainfall. Satellite estimates on both days are within a factor of two of ground truth. Sources of error in the component relationships are enumerated. Several planned refinements, such as stratification of the data by synoptic condition and origin of convection, are presented. (Author)

**A75-16240 \*** Coastal and estuarine studies with ERTS-1 and Skylab. V. Klemas, D. Bartlett, W. Philpot (Delaware University, Newark, Del.), R. Rogers, and L. Reed (Bendix Corp., Aerospace Div., Ann Arbor, Mich.). *Remote Sensing of Environment*, vol. 3, no. 3, 1974, p. 153-174. 13 refs. Contracts No. NAS5-21837; No. NAS1-12304; No. N00014-69-A-0407.

Coastal vegetation, land use, current circulation, water turbidity, and ocean waste dispersion were studied by interpreting ERTS-1 and Skylab imagery with the help of ground truth collected during overpasses. Based on high-contrast targets such as piers and roads, the ERTS-1 multispectral scanner was found to have a resolution of 70-100 m, Skylab's S190A cameras about 20-40 m, and its S190B camera about 10-20 m. Important coastal land-use details can be more readily mapped using Skylab's imagery. On the other hand, the regular 18-day cycle of ERTS-1 allows observation of important man-made and natural changes, and facilitates collection of ground truth. (Author)

**A75-17138 #** Flood inundation in the southeastern United States from aircraft and satellite imagery. G. K. Moore and G. W. North (U.S. Geological Survey, Bay St. Louis, Miss.). In: *International Symposium on Remote Sensing of Environment*, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 607-620. 5 refs.

**A75-17140 \* #** A hydrogeomorphic approach to evaluating flood potential in central Texas from orbital and suborbital remote sensing imagery. V. R. Baker, R. K. Holz, and S. D. Hulke (Texas University, Austin, Tex.). In: *International Symposium on Remote Sensing of Environment*, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 629-645. 27 refs. Contract No. NAS9-13312.



**A75-17160 \* #** Extensive summer upwelling on Lake Michigan during 1973 observed by NOAA-2 and ERTS-1 satellites. A. E. Strong, H. G. Stumpf, J. L. Hart, and J. A. Pritchard (NOAA, National Environmental Satellite Service, Hillcrest Heights, Md.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 923-932. 7 refs. NASA Order S-70246-AG.

Two studies are presented that utilize data from the NOAA-2 and ERTS-1 satellites. The studies are concentrated on two summer upwelling episodes in Lake Michigan when considerable contrast was observed in both surface water temperature as observed by NOAA-2 and surface water color as observed by ERTS-1. Physical, biological and chemical processes support the hypothesis that much of the observed 'whitening' is calcium carbonate precipitating as an immediate result of the upwelling. (Author)

**A75-17161 #** Remote sensing of western Lake Superior. K. Stortz and M. Sydor (Minnesota, University, Duluth, Minn.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 933-937. Grant No. DACW37-74-C-0014.

Correlation of ERTS data with measurements of turbidity and transmittance for water in the Duluth-Superior harbor and the adjacent Lake Superior water is used in production of turbidity maps for the extreme western arm of Lake Superior. Comparison of reflectance of water obtained from ERTS Bands 4, 5, and 6 as a function of suspended solids indicates the possibility of using this data in effluent tracing. Correlation of ground truth with satellite data allows for extension of results obtained from measurements at few key stations to a large area of the lake. The ability to do this is exceedingly important in the environmental studies of large bodies of water, where the dynamic nature of the system cost prohibits sufficient sampling measurements to cover the entire area. (Author)

**A75-17163 #** The use of remote sensing in limnological studies. C. T. Wezernak (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 963-980. 6 refs. NSF Grant No. GI-34809X.

The concept of a remote sensing trophic index for use in lake assessment is discussed and a comparative analysis of field and remote sensing data for a group of lakes is presented. The results demonstrate the potential of remote sensing for use in limnological studies. Results indicate that changes in the optical properties of a lake, as determined by remote sensing, can be used to assess the trophic state of a lake. (Author)

**A75-17164 #** Automatic classification of eutrophication of inland lakes from spacecraft data. R. H. Rogers, L. E. Read, N. J. Shah (Bendix Corp., Aerospace Systems Div., Ann Arbor, Mich.), and V. E. Smith (Cranbrook Institute of Science, Bloomfield Hills, Mich.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 981-993.

Spacecraft data and computer techniques can be used to rapidly map and store onto digital tapes watershed land-use information. Software is now available by which this land-use information can be rapidly and economically extracted from the tapes and related to coliform counts and other lake contaminants, e.g., phosphorus. These tools are basic elements for determining those land-use factors and sources of nutrients that accelerate eutrophication in lakes and reservoirs. (Author)

**A75-17178 \* #** Coastal wetlands analysis from ERTS MSS digital data and field spectral measurements. V. Carter (U.S. Geological Survey, Reston, Va.) and J. Schubert (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1241-1260. 17 refs.

Classification, delineation and evaluation of coastal wetlands can be made on the basis of major vegetative associations. To produce wetland maps, two vegetation-analysis look-up tables were developed for use in the ERTS ANALYSIS System. These look-up tables are based on Earth Resources Technology Satellite (ERTS) digital values in Multispectral Scanner (MSS) bands 4, 5, and 7 and were developed using seasonal spectral reflectance measurements from field observations. Computer-generated maps at an approximate scale of 1:20,000 were produced for the primary test site, Chincoteague Marsh, Virginia. There is a high degree of accuracy in the identification of wetland features and plant associations. The classification was also tested on other Atlantic coast salt marshes and a brackish marsh in the Chesapeake Bay. (Author)

**A75-17179 \* #** California nearshore processes - ERTS 1. D. D. Steller (Geosource International, Inc., Seal Beach, Calif.) and D. M. Pirie (U.S. Army, Corps of Engineers, San Francisco, Calif.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1261-1278. NASA Order S-70257-AG.

The detectability of many nearshore processes from ERTS is made possible due to the suspended sediment present in the coastal waters. From viewing and analyzing the California coastal imagery collected during the last year and a half, the overall current patterns and their changes have become evident. It is now possible to map monthly and seasonal changes that occur throughout the year. The original objectives of detecting currents, sediment transport, estuaries and river discharge have now been expanded to include the use of ERTS information in operational problems of the U.S. Army Corps of Engineers. This incorporates the detected nearshore features into planning and organizing shore protection facilities. (Author)

**A75-17180 #** Surface currents along the California coast observed on ERTS imagery. P. R. Carlson (U.S. Geological Survey, Menlo Park, Calif.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1279-1288. 11 refs.

**A75-17181 \* #** Correlation of coastal water turbidity and current circulation with ERTS-1 and Skylab imagery. V. Klemas, M. Otley, W. Philpot, C. Wethe (Delaware, University, Newark, Del.), R. Rogers, and N. Shah (Bendix Corp., Aerospace Div., Ann Arbor, Mich.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1289-1317. 14 refs. Contracts No. NAS5-21837; No. N00014-69-A-0407.

The article reviews investigations of current circulation patterns, suspended sediment concentration, coastal frontal systems, and waste disposal plumes based on visual interpretation and digital analysis of ERTS-1 and Skylab/EREP imagery. Data on conditions in the Delaware Bay area were obtained from 10 ERTS-1 passes and one Skylab pass, with simultaneous surface and airborne sensing. The current patterns and sediments observed by ERTS-1 correlated well with ground-based observations. Methods are suggested which would make it possible to identify certain pollutants and sediment types from multispectral scanner data. A.T.S.

**A75-17200 #** Microwave radiometric characteristics of snow-covered terrain. R. P. Moore and J. O. Hooper (U.S. Naval Weapons Center, China Lake, Calif.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1621-1632. 7 refs.

A very sensitive Ka-band microwave radiometer has been used to map agricultural areas during winter, spring, and summer seasons, and at various altitudes. This radiometer employs a parametric amplifier to achieve its ultrahigh sensitivity. The mapping function is accomplished by rotating parabolic antennas which scan the beam in the cross-track direction. The forward motion of the aircraft provides the other dimension. The area mapped is a strip which has a width four times the altitude of the aircraft. The system is capable of rapid installation and removal. The radiometer will operate automatically over a wide range of speeds and altitudes and is capable of either a Dicke or high-speed mode of operation. The temperature sensitivity and spatial resolution are sufficient to produce detailed images of the terrain. In addition to solving the problem of terrain remote sensing through snow cover, this technique provides a means by which to survey large areas in a short period of time. (Author)

**A75-17950 \*** Microwave profiling of snowpack free-water content. W. I. Linlor (NASA, Ames Research Center, Moffett Field, Calif.), M. F. Meier (U.S. Geological Survey, Tacoma, Wash.), and J. L. Smith (U.S. Forest Service, Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.). In: Advanced concepts and techniques in the study of snow and ice resources. Washington, D.C., National Academy of Sciences, 1974, p. 729-736.

A microwave system is proposed to measure the amount of liquid-phase water in a snowpack operating in the range of 1 to 10 GHz. Attenuation of the beam between source and receivers is produced by the water in the snow. The relationships of frequency, distance, and volume percent of water are calculated for an assumed detector sensitivity, together with the estimated cost of a representative system. A laboratory test is described that shows the attenuation for snow at maximum wetness at 9.35 GHz. A configuration is proposed that involves a vertical tube containing microwave and radioactive sources and another vertical tube containing microwave and gamma-ray detectors, so that density and wetness profiles are obtained simultaneously over essentially the same path. (Author)

**A75-18067** Monitoring trophic status of inland lakes - A quantitative application of ERTS imagery. F. L. Scarpace (Wisconsin, University, Madison, Wis.) and R. E. Wade (Wisconsin Department of Natural Resources, Madison, Wis.). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Church, Va., American Society of Photogrammetry, 1974, p. 232-239.

**N75-10539\*#** Geological Survey, Tacoma, Wash. **EVALUATE ERTS IMAGERY FOR MAPPING AND DETECTION OF CHANGES OF SNOWCOVER ON LAND AND ON GLACIERS** Semiannual Progress Report, 1 Jan. - 30 Jun. 1973

Mark F. Meier, Principal Investigator 1 Jul. 1973 7 p ERTS (NASA Order S-70243-AG) (E74-10812; NASA-CR-140569) Avail: NTIS HC \$3.25 CSCL 08L

The author has identified the following significant results. A new procedure to determine snowcovered areas has been devised. Aside from problems in heavily forested areas this method shows promise in predicting snowmelt runoff from mountain areas and will also assist in energy balance modeling of large snowfields. Snowcover results compare favorably with measurements made by high altitude aircraft photography. Changes in snowcover in areas as small as 3 x 5 km can be determined from ERTS-1 images by both optical and electronic methods. Snowcover changes determined by these two methods in the experimental South Cascade Glacier Basin were verified by field mapping.

Image enhancement techniques on ERTS-1 images of large Alaskan glaciers (the Hubbard, Yentna, and Kahiltna) have given new insights into the large-scale structures and flow dynamics of these potentially hazardous glaciers. The Hubbard Glacier, in particular, is one which poses a threat to man and should be monitored for future changes.

**N75-10540\*#** Geological Survey, Miami, Fla. **SURFACE WATER MODELING EVERGLADES WATER BASIN, FLORIDA** Bimonthly Progress Report, 1 May - 30 Jun. 1974

Aaron L. Higer, Principal Investigator, E. T. Wimberly, E. H. Cordes, and A. E. Coker Jul. 1974 4 p ERTS (NASA Order S-70243-AG-7) (E74-10814; NASA-CR-140616) Avail: NTIS HC \$3.25 CSCL 08H

**N75-10541\*#** Geological Survey, Reston, Va. **DYNAMICS OF SUSPENDED SEDIMENT PLUMES IN LAKE ONTARIO** Semiannual Progress Report, 1 Jan. - 30 Jun. 1974

Edward J. Pluhowski, Principal Investigator 1 Jul. 1974 4 p ERTS (NASA Order S-70243-AG-2) (E74-10815; NASA-CR-140617) Avail: NTIS HC \$3.25 CSCL 08H

The author has identified the following significant results. Although turbidity plumes in Lake Ontario are usually not visible during the winter, meteorologic and hydrologic events may combine to ensure their detection. The clearly defined Niagara River plume of January 25, 1974, was the result of turbid water entering the river at its source near the eastern end of Lake Erie. A persistent southwest wind mild temperature resulted in a pile-up of ice free but turbid water at the source of the Niagara River where the highly colored water entered the river. Upon discharge into Lake Ontario, the Niagara River water appears several shades lighter in tone than the ambient lake water. On February 12, 1974, eastward moving ice floes along the Ontario shoreline were forced to move around the hydraulic barrier created by the Niagara River jet. As a result the Niagara River plume was clearly portrayed by a halo-like band of slush ice borne by wind-driven nearshore currents.

**N75-10542\*#** American Univ., Washington, D.C. Dept. of Biology. **SKYLAB-EREP INVESTIGATIONS OF WETLANDS ECOLOGY**

Bimonthly Progress Report, 6 Aug. - 6 Oct. 1974

Richard R. Anderson, Principal Investigators, Virginia P. Carter, and Linda J. Alsid 6 Oct. 1974 4 p EREP (Contract NAS1-12209)

(E74-10816; NASA-CR-140618) Avail: NTIS HC \$3.25 CSCL 08A

**N75-11409\*#** Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.

**WATER SURVEY OF CANADA: APPLICATION FOR USE OF ERTS-A FOR RETRANSMISSION OF WATER RESOURCES DATA** Progress Report, 1 Apr. - 30 Sep. 1974

R. A. Halliday, Principal Investigator and I. A. Reid Oct. 1974 6 p Sponsored by NASA ERTS

(E74-10805; NASA-CR-140499) Avail: NTIS HC \$3.25 CSCL 08H

The author has identified the following significant results. The fact that water resources data can be retransmitted from remote areas of Canada by polar orbiting spacecraft to users in population centers on a near real time basis reliably, accurately, and at relative low cost continues to be demonstrated. Over 60,000 transmissions from the nine data collection platforms installed at Water Survey of Canada gauging stations have been received. The stage and ice-out data retransmitted via ERTS-1 have been plotted on a chart record produced by a water stage

## 06 HYDROLOGY AND WATER MANAGEMENT

servo-manometer installed on the Albany River. The stage increased smoothly until shortly after noon on May 19, 1974. During this time the indicator showed that the ice surface was intact. The stage then dropped sharply and the indicator read that the ice was out. The erratic chart trace after that was consistent with the assumption that the ice surface had broken up and that some short duration jams of broken ice were occurring.

**N75-12401\*#** Geological Survey, Bay Saint Louis, Miss.  
**HYDROLOGIC SIGNIFICANCE OF LINEAMENTS IN CENTRAL TENNESSEE** Quarterly Progress Report, 1 Jun. - 31 Aug. 1974  
Gerald K. Moore and Este F. Hollyday, Principal Investigators  
31 Aug. 1974 6 p EREP  
(NASA Order H-2810-B)  
(E75-10030; NASA-CR-140741) Avail: NTIS HC \$3.25 CSCL 08H

**N75-12408\*#** Environmental Research Inst. of Michigan, Ann Arbor.  
**A SKYLAB PROGRAM FOR THE INTERNATIONAL HYDROLOGICAL DECADE (IHD)** Quarterly Report, Dec. 1973 - Feb. 1974  
Fabian C. Polcyn and Thomas W. Wagner, Principal Investigators  
18 Nov. 1974 3 p EREP  
(Contract NAS9-13275)  
(E75-10039; NASA-CR-140776; ERIM-102300-8-L) Avail: NTIS HC \$3.25 CSCL 08H

**N75-13342\*#** Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.  
**WATER SURVEY OF CANADA: APPLICATION FOR USE OF ERTS-A FOR RETRANSMISSION OF WATER RESOURCES DATA** Progress Report, Jun. 1973 - Jul. 1974  
R. A. Halliday, Principal Investigator and I. A. Reid Oct. 1974 10 p Sponsored by NASA ERTS  
(E75-10026; NASA-CR-140739) Avail: NTIS HC \$3.25 CSCL 08H

The author has identified the following significant results. Water resources data were retransmitted from nine data collection platforms (DCP) located in remote regions of Canada. The DCPs located in the Arctic operated in temperatures lower than -40 C and the DCP antennas have survived wind speeds of greater than 80 kph and snow loads of a depth of one metre. Ice-out indicators were installed at a few DCP sites. The purpose of these indicators was to enable the detection of the movement of ice out of river channel during spring break-up. The suitability of satellite retransmission as a means of obtaining data from remote areas of Canada continues to be demonstrated. A modest expansion of the DCP network is planned.

**N75-13344\*#** National Aeronautics and Space Administration. Mississippi Test Facility, Bay Saint Louis.  
**EVALUATION OF SATELLITE REMOTE SENSING AND AUTOMATIC DATA TECHNIQUES FOR CHARACTERIZATION OF WETLANDS AND COASTAL MARSHLANDS** Final Report, Jul. 1972 - Jun. 1974  
Robert H. Cartmill, Principal Investigator 29 Jul. 1974 139 p refs Original contains color illustrations. Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS  
(E75-10028; NASA-TM-X-72063; Rept-128) Avail: NTIS HC \$5.75 CSCL 05B

The author has identified the following significant results. The evaluation was conducted in a humid swamp and marsh area of southern Louisiana. ERTS digital multispectral scanner data was compared with similar data gathered by intermediate altitude aircraft. Automatic data processing was applied to several data sets to produce simulated color infrared images, analysis

of single bands, thematic maps, and surface classifications. These products were used to determine the effectiveness of satellites to monitor accretion of land, locate aquatic plants, determine water characteristics, and identify marsh and forest species. The results show that to some extent all of these can be done with satellite data. It is most effective for monitoring accretion and least effective in locating aquatic plants. The data sets used show that the ERTS data is superior in mapping quality and accuracy to the aircraft data. However, in some applications requiring high resolution or maximum use of intermittent clear weather conditions, data gathering by aircraft is preferable. Data processing costs for equivalent areas are about three times greater for aircraft data than ERTS data. This is primarily because of the larger volume of data generated by the high resolution aircraft system.

**N75-13348\*#** Environmental Research Inst. of Michigan, Ann Arbor.  
**SKYLAB WATER DEPTH DETERMINATION** Quarterly Progress Report, 1 Sep. - 30 Nov. 1973  
F. C. Polcyn and D. R. Lyzenga, Principal Investigators 25 Nov. 1974 3 p EREP  
(Contract NAS9-13278)  
(E75-10048; NASA-CR-140950; ERIM-102100-11-L) Avail: NTIS HC \$3.25 CSCL 08J

**N75-13350\*#** Agricultural Research Service, Weslaco, Tex.  
**IRRIGATION SCHEDULING, FREEZE WARNING AND SOIL SALINITY DETECTING** Monthly Progress Report, Nov. 1974  
Craig L. Wiegand, Principal Investigator Nov. 1974 4 p EREP  
(NASA Order T-4105-B)  
(E75-10050; NASA-CR-140952; MPR-11) Avail: NTIS HC \$3.25 CSCL 02C

**N75-13353\*#** Department of the Environment, Ottawa (Ontario). Applied Hydrology Div.  
**WATER SURVEY OF CANADA: APPLICATION FOR USE OF ERTS-A FOR RETRANSMISSION OF WATER RESOURCES DATA** Final Report, Jul. 1972 - Jun. 1974  
R. A. Halliday, Principal Investigator and I. A. Reid Aug. 1974 27 p refs Sponsored by NASA ERTS  
(E75-10053; NASA-CR-140959) Avail: NTIS HC \$3.75 CSCL 08H

The author has identified the following significant results. Water resources data including water level, water velocity, precipitation, air temperature, ice condition, DCP battery voltage, and water stage recorder clock operation have been transmitted from remote areas in Canada using the ERTS Data Collection System. The Data Collection Platforms have met all requirements. The suitability of satellite retransmission as a means of obtaining data from remote areas has been demonstrated. The present network of 9 Data Collection Platforms will be expanded to 28 to develop a quasi-operational network.

**N75-13365\*#** Corps of Engineers, Waltham, Mass.  
**NEW ENGLAND RESERVOIR MANAGEMENT** Quarterly Progress Report, 23 Jul. - 23 Oct. 1974  
Saul Cooper and Duwayne Anderson, Principal Investigators (CRREL) 23 Oct. 1974 4 p EREP  
(NASA Order T-4646-B)  
(E75-10065; NASA-CR-141005) Avail: NTIS HC \$3.25 CSCL 08H

**N75-13371\*#** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

**THE ERTS-1 INVESTIGATION (ER-600). VOLUME 2: ERTS-1 COASTAL/ESTUARINE ANALYSIS** Report for period Jul. 1972 - Jun. 1973

R. Bryan Erb Jul. 1974 286 p refs Original contains color illustrations (NASA-TM-X-58118; JSC-08457) Avail: NTIS HC \$8.75 CSCL 08J

The Coastal Analysis Team of the Johnson Space Center conducted a 1-year investigation of ERTS-1 MSS data to determine its usefulness in coastal zone management. Galveston Bay, Texas, was the study area for evaluating both conventional image interpretation and computer-aided techniques. There was limited success in detecting, identifying and measuring areal extent of water bodies, turbidity zones, phytoplankton blooms, salt marshes, grasslands, swamps, and low wetlands using image interpretation techniques. Computer-aided techniques were generally successful in identifying these features. Aerial measurement of salt marshes accuracies ranged from 89 to 99 percent. Overall classification accuracy of all study sites was 89 percent for Level 1 and 75 percent for Level 2.

Author

**N75-14194\*#** Kansas Univ., Lawrence.

**SKYLAB STUDY OF WATER QUALITY** Progress Report, Sep. - Nov. 1974

Harold L. Yarger, Principal Investigator and James R. McCauley Nov. 1974 7 p EREP

(Contract NAS9-13271)

(E75-10075; NASA-CR-141096) Avail: NTIS HC \$3.25 CSCL 08H

The author has identified the following significant results. Radiometric data derived from S-190A photography appears to correlate reasonably well with suspended solids without the need of rationing the radiances of different bands.

**N75-14227** Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Satellitenelektronik.

**MAPPING OF WATER BODIES IN NORTHERN GERMANY FROM ERTS TAPES**

G. Kritikos, B. Sahai, and E. Triendl In ESRO European Earth-Resources Satellite Expts. May 1974 p 107-119

Computer-compatible magnetic tapes carrying ERTS MSS data pertaining to northern Germany were examined with the aim of making a classification map of the water bodies in the region. A digital picture processing system was used to reconstruct and process the pictures. The water bodies that are not clearly distinguishable in the individual spectral bands because of unwanted background such as clouds and shadows can be demarcated clearly by taking the difference between intensities in different spectral bands. Using ratio mapping and other techniques, an automatic classification map of the water bodies in the region has been prepared.

Author (ESRO)

**N75-14230** Institut Geographique National, Paris (France).

**INTERPRETATION OF ERTS-1 DATA FOR INVESTIGATING THE FRENCH WESTERN COASTAL ZONES (FRALIT PROGRAM) [L'INTERPRETATION DES DONNEES ERTS-1 POUR L'ETUDE DE LA FACADE OUEST DE LA FRANCE (PROGRAMME FRALIT)]**

P. Demathieu and R. Brossier In ESRO European Earth-Resources Satellite Expts. May 1974 p 143-150 ref In FRENCH; ENGLISH summary Original contains color illustrations

Application of ERTS 1 data to a program consisting of a study of the western coastline of France covering both the sea (currents, sedimentology) and the wetlands (sea marshes) is described. The first stage of the work involved trying the maximum number of methods, ranging from conventional photointerpretation to numerical processing. In a second phase, the numerical methods

were extensively developed. The ERTS-1 data proved to be a source of completely new knowledge as regards the dynamic sedimentology of coastal zones. ERTS images can also reveal hitherto completely unknown hydrological phenomena.

Author (ESRO)

**N75-14232** Zurich Univ. (Switzerland).

**METHODOLOGICAL ASPECTS AND REGIONAL EXAMPLES OF SNOW-COVER MAPPING FROM ERTS-1 AND EREP IMAGERY OF THE SWISS ALPS**

H. Haefner (Swiss Federal Inst. of Technol.) and K. Seidel In ESRO European Earth-Resources Satellite Expts. May 1974 p 155-164 refs Original contains color illustrations

A quick-look method of mapping snow cover and measuring the areal extent of its surface was developed, allowing rapid interpretation of each image. The method combines the advantages of an automatic photo-quantier with high-resolution photographic techniques for a rapid determination of the variation in the snow cover and its boundaries. The method is demonstrated for a test area of about 170 sq km in the southeastern Swiss Alps and with vertical differences of about 2000 m. The results are combined and compared with ground information. The method could also be applied to data from a source other than ERTS.

Author (ESRO)

**N75-14233** Norwegian Water Resources and Electricity Board, Oslo.

**ERTS-1 IMAGES IN GLACIOLOGY AND HYDROLOGY: NORWEGIAN EXPERIENCE**

G. Ostrem In ESRO European Earth-Resources Satellite Expts. [May 1974] (date) p 165-172 Original contains color illustrations

In order to determine glaciological mass balance, use was made of aerial photographs and ERTS images. By projecting enlarged ERTS images onto topographic maps, the height of the transient snow line can be determined (particularly from MSS 6 and 7) and a good estimate can be obtained of the glacier mass balance over large areas. Both color-composite techniques and image enhancement with contour film have been tried. Experiments with photographic density slicing of ERTS images have shown that the areal extent of snow cover can be delineated and areas of very thick snow (with the highest reflectance) can be separated from thin (or wet) snow. Heavily sediment-loaded glacier streams can be distinguished from less sediment-loaded waters with a similar technique. A cost/benefit estimate is presented.

Author (ESRO)

**N75-14260#** Montana State Univ., Bozeman. Water Resources Research Center.

**WATER RESOURCE AND HAZARD PLANNING REPORT FOR THE CLARK FORK RIVER VALLEY ABOVE MISSOULA, MISSOULA COUNTY, MONTANA**

Robert J. Wheeler Jul. 1974 78 p refs Sponsored in part by Dept. of Agriculture

(Contract DI-14-31-0001-3826)

(PB-236041/0; MUJWRR-51; OWRR-A-065-MONT(1)) Avail:

NTIS HC \$4.75 CSCL 08H

A 33-mile reach of the Clark Fork River east of Missoula, Montana, was the subject of a two-year hydrology and flood hazard study. The 100-year flood plain was delineated by a unique method incorporating aerial photographs obtained during a flood of known recurrence interval, and synthesized rating curves developed for several sites in the reach. The maps, which were developed at a cost of \$120 per river mile, are believed to be nearly as accurate as maps obtained by more sophisticated and costly techniques. Water levels in 20 wells were monitored during a one-year period to determine piezometric surfaces and water table fluctuations. Gravity traverses were made to determine bedrock configurations and depths to bedrock.

GRA

**N75-15108\*#** Delaware Univ., Newark. Coll. of Marine Studies.

**MONITORING PHYSICAL AND CHEMICAL PARAMETERS**

## 06 HYDROLOGY AND WATER MANAGEMENT

### OF DELAWARE BAY WATERS WITH AN ERTS-1 DATA COLLECTION PLATFORM Report on Significant Results

V. Klemas, Principal Investigator and C. Wethe 6 Jan. 1975

2 p ERTS

(Contract NAS5-21837)

(E75-10090; NASA-CR-141154) Avail: NTIS HC \$3.25 CSCL 08J

The author has identified the following significant results. Results of the analysis of data collected during the summer of 1974 demonstrate that the ERTS Data Collection Platform (DCP) is quite responsive to changing water parameters and that this information can be successfully transmitted under all weather conditions. The monitoring of on-site probe outputs reveals a rapid response to changing water temperature, salinity, and turbidity conditions on incoming tides as the tidal salt wedge passes the probe location. The changes in water properties were corroborated by simultaneously sampling the water for subsequent laboratory analysis. Fluctuations observed in the values of salinity, conductivity, temperature and water depth over short time intervals were extremely small. Due to the nature of the probe, 10% to 20% fluctuations were observed in the turbidity values. The use of the average of the values observed during an overpass provided acceptable results. Good quality data was obtained from the satellite on each overpass regardless of weather conditions. Continued use of the DCP will help provide an indication of the accuracy of the probes and transmission system during long term use.

**N75-15111\*#** Environmental Research Inst. of Michigan, Ann Arbor.

### A SKYLAB PROGRAM FOR THE INTERNATIONAL HYDROLOGICAL DECADE (IHD) Quarterly Report, Jun. - Aug. 1974

Fabian C. Polcyn, Principal Investigator and Diana L. Rebel 9 Dec. 1974 3 p EREP

(Contract NAS9-13275)

(E75-10093; NASA-CR-141157; ERIM-102300-13-L) Avail: NTIS HC \$3.25 CSCL 08H

The author has identified the following significant results. The development of the algorithm (using real data) relating red and IR reflectance to surface soil moisture over regions of variable vegetation cover will enable remote sensing to make direct inputs into determination of this important hydrologic parameter.

**N75-15112\*#** Environmental Research Inst. of Michigan, Ann Arbor.

### A SKYLAB PROGRAM FOR THE INTERNATIONAL HYDROLOGICAL DECADE (IHD) Quarterly Report, Mar. - May 1974

Fabian C. Polcyn, Principal Investigator and Diana L. Rebel 9 Dec. 1974 3 p EREP

(Contract NAS9-13275)

(E75-10094; NASA-CR-141057; ERIM-102300-12-L) Avail: NTIS HC \$3.25 CSCL 08H

## 07

DATA PROCESSING AND  
DISTRIBUTION SYSTEMS

Includes film processing, computer technology, satellite and aircraft hardware, and imagery.

**A75-10435** Automated image processing in forestry. D. V. Smith. (*American Society of Photogrammetry, Annual Convention, St. Louis, Mo., Mar. 11, 1974.*) *Photogrammetric Engineering*, vol. 40, Oct. 1974, p. 1187-1190.

Investigated are methods of automated image processing in natural resources. The interpretation phase and the mapping phase are recognized in the developed automated techniques for mapping forest resources. An automated digital mapping system is being developed to form a part of a resource information system in combination with certain automated interpretation methods. Specific information may be extracted from color and color-infrared films rather than using multiband photography. Multiband photographic equipment is expensive, but the system offers flexibility in terms of the results obtained in each of the spectral bands. T.S.

**A75-11274** Satellites and computer in the service of meteorology: WWW - The global weather observation system (Satelliten und Computer im Dienst der Meteorologie: WWW - Das globale Wetterbeobachtungs-System). R. F. Gebhart (World Meteorological Organization, Education Training and Research Dept., Geneva, Switzerland). *VDI-Z*, vol. 116, no. 14, Oct. 1974, p. 1157-1159. In German.

A plan for a new global weather observation system, the World Weather Watch (WWW), was developed by the World Meteorological Organization. The WWW project is to be stepwise implemented. The global observation system of WWW is to collect the meteorological data from all areas of the earth which are needed for the daily weather forecasts and for research applications. The observation system makes use of the most modern technological developments including novel radar systems and satellites. The processing of the data in an integrated system of meteorological centers utilizing modern computing technology is also discussed. G.R.

**A75-11419** Analytical estimates of precision in determining parameters of motion of artificial earth satellite when analyzing imprecise measurements with correlated errors. L. F. Porfir'ev and V. V. Smirnov. (*Kosmicheskie Issledovaniia*, vol. 12, Mar.-Apr. 1974, p. 299-301.) *Cosmic Research*, vol. 12, no. 2, Sept. 1974, p. 270-272. Translation.

**A75-11822 \*** The community satellite. III. *Spaceflight*, vol. 16, Nov. 1974, p. 423-426, 440.

A number of technology experiments conducted with the satellite are discussed, giving attention to a very high resolution radiometer experiment, a radio frequency interference experiment, a millimeter wave propagation experiment, a COMSAT propagation experiment, a cesium bombardment ion engine experiment, an advanced thermal control flight experiment, a spacecraft attitude experiment, a radio beacon experiment, and environmental measurements experiments. Special investigations considered are related to the use of a spacecraft vibration accelerometer, a quartz crystal microbalance contamination monitor, and a television camera. G.R.

**A75-13310 #** A generator of high-power current pulses of semisinusoidal shape for an aerial variant of the method of transient processes (Generator moshchnykh tokovykh impul'sov polusinusoidal'noi formy dlia aerovarianta metoda perekhodnykh protsessov). A. S. Lutsychin and V. A. Mamaev. *Otbor i Peredacha Informatsii*, no. 38, 1974, p. 83-90. In Russian.

Description of a generator of high-power alternating semisinusoidal current pulses which is constructed on the basis of a bridge-type thyristor inverter. An analysis is made of the processes occurring in the inverter circuit, and the conditions for obtaining the maximum magnetic dipole moment that can be supplied by this generator are indicated. The proposed generator is shown to have a number of advantages which make it suitable for aerial prospecting by the method of transient processes. A.B.K.

**A75-13526** A camera for photography of atmospheric particles from aircraft. T. W. Cannon (National Center for Atmospheric Research, Boulder, Colo.). *Review of Scientific Instruments*, vol. 45, Nov. 1974, p. 1448-1455. 12 refs. NSF-sponsored research.

**A75-13741 #** Geoscientific research with rockets and satellites. J. Bodechtel (Zentralstelle für Geo-Photogrammetrie und Fernerkundung, Munich, West Germany). *International Astronautical Federation, International Astronautical Congress, 25th, Amsterdam, Netherlands, Sept. 30-Oct. 5, 1974, Paper 74-116*. 10 p.

The Gemini and Apollo photographic programs showed the significant advantages of using spaceborne remote sensing in earth sciences. Satellites offer continuous repetition rate, long-term observation, and large area coverage. Skylab showed the importance of manned, predominantly experimental, space missions and their restricted use for operational monitoring. Spacelab, on experimental missions, will serve as an optimum sensor platform to define operational models. Earth-observation satellites are supported by airborne and ground-based observation and analysis. A.T.S.

**A75-13758 #** Orientation of methods of information processing for the control of terrestrial resources (Orientation des méthodes de traitement de l'information pour le contrôle des ressources terrestres). J. L. Bessis (Centre National d'Etudes Spatiales, Toulouse, France). *International Astronautical Federation, International Astronautical Congress, 25th, Amsterdam, Netherlands, Sept. 30-Oct. 5, 1974, Paper 74-140*. 16 p. 5 refs. In French.

The Mathematical and Processing Division participates in the development of the coherent program put in place by the National Center of Space Studies since 1970 in a new technique named 'teledetection'. In the European context this program is characterized by a plurality of missions of restricted dimension well adapted to the multidisciplinary character of its applications. Whatever the type of detector utilized, it receives the radiation provided by the ground in one or several ranges of wavelength, transforms it into an electric signal, and memorizes the information. The data issued from the scanning systems (radiometer) or on-board cameras are only considered, with the data from the on-board cameras stored on an analog band or in an on-board memory. F.R.L.

**A75-13760 #** Comparison of existing earth resources data processing facilities. G. P. Fishman (General Electric Co., Philadelphia, Pa.). *International Astronautical Federation, International Astronautical Congress, 25th, Amsterdam, Netherlands, Sept. 30-Oct. 5, 1974, Paper 74-144*. 16 p.

The paper provides readers potentially interested in establishing their own capability for accessing ERTS data, with an overview of the ground systems currently in operation in the U.S., Canada, and Brazil, and under active development in Italy and the Federal Republic of Germany. The reader is cautioned to look upon these facilities as examples only. There are many ways to implement ERTS

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ground systems ranging from small, relatively inexpensive options to large, complex, and costly implementations. Each implementation plan should be carefully analyzed to fit the needs and budget of the prospective user. F.R.L.

**A75-16476 \*** Ground-based determination of atmospheric radiance for correction of ERTS-1 data. K. Peacock (Bendix Corp., Aerospace Systems Div., Ann Arbor, Mich.). *Applied Optics*, vol. 13, Dec. 1974, p. 2741, 2742. Contract No. NAS5-21863.

A technique is described for estimating the atmospheric radiance observed by a downward sensor (ERTS) using ground-based measurements. A formula is obtained for the sky radiance at the time of the ERTS overpass from the radiometric measurement of the sky radiance made at a particular solar zenith angle and air mass. A graph illustrates ground-based sky radiance measurements as a function of the scattering angle for a range of solar air masses. Typical values for sky radiance at a solar zenith angle of 48 degrees are given. T.S.

**A75-16569** Transformation of terrestrial survey data to Doppler satellite datum. R. J. Anderle (U.S. Naval Material Command, Naval Weapons Laboratory, Dahlgren, Va.). (*International Association of Geodesy, Symposium on Computation Methods in Geometrical Geodesy, Oxford, England, Sept. 1973.*) *Journal of Geophysical Research*, vol. 79, Dec. 10, 1974, p. 5319-5331. 7 refs.

Doppler satellite observations have been used to determine the positions of 37 sites that were part of a network occupied by BC-4 cameras. Analysis of the Doppler observations by fitting orbits to 48-hour spans of data yielded positions for the sites that are consistent with the results of geometric analysis of the camera observations. Analysis of the data for the 37 sites provided shifts bringing 26 local datums to a world geodetic system. The estimated accuracy of the Doppler datum is about 1.5 m in each component of station position with a probable scale bias of 1 ppm. (Author)

**A75-16690** Cloud screening from aerial photography applying coherent optical pattern recognition techniques. G. E. Lukes (U.S. Army, Engineering Topographic Laboratories, Fort Belvoir, Va.). In: *Coherent optics in mapping; Proceedings of the Tutorial Seminar and Technology Utilization Program, Rochester, N.Y., March 27-29, 1974.* Palos Verdes Estates, Calif., Society of Photo-optical Instrumentation Engineers, 1974, p. 265-272. 8 refs.

**A75-17110 \* #** Classification and mapping of coal refuse, vegetative cover types, and forest types by digital processing ERTS-1 data. F. Y. Borden, B. F. Merembeck, D. N. Thompson, B. J. Turner, and D. L. Williams (Pennsylvania State University, University Park, Pa.). In: *International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1.* Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 133-152. 9 refs. Research supported by the Hatch Fund; Contract No. NAS5-23133.

**A75-17115 \* #** Feasibility of using multiplexed SLAR imagery for water resources management and mapping vegetation communities. B. Drake and R. A. Shuchman (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: *International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1.* Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 219-249. 6 refs. Contract No. NAS10-8333.

A two-wavelength (X band and L band) multiplexed synthetic aperture side-looking airborne radar (SLAR), providing parallel and cross-polarized images, has been tested for application in mapping vegetation and water resources. Indications of the relative heights, densities, surface roughness and other parameters provided by the

multiplexed radar imagery can be used to differentiate and map various types of vegetation. The multiplexed SLAR is superior to thermal IR imagery and aerial photography for determining heights of vegetation and water-land boundaries. A.T.S.

**A75-17116 \* #** Four channel simultaneous X-L band imaging SAR radar. R. Rawson and F. Smith (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: *International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1.* Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 251-270. Contracts No. NAS9-12967; No. NAS9-11036.

Design considerations, construction, and testing of a four-channel microwave radar imaging system are described. Various components of the system are described in some detail including the receiver, transmitter, recorders, and the general timing circuitry. Results from flight tests of the system are described. The system is unique in that images from four microwave channels are provided and the data is obtained simultaneously. Energy is radiated at both 3 cm and 25 cm wavelengths; the four receiving channels are 3 cm, like and crossed polarization and 25 cm, like and crossed polarization. (Author)

**A75-17117 #** Extraction of urban land cover data from multiplexed synthetic aperture radar imagery. M. L. Bryan (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: *International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2.* Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 271-288. 20 refs.

The dual-frequency, dual-polarized side-looking airborne radar (SLAR) was used to collect land-use data in two separate areas in metropolitan Detroit. The data used consisted of a set of vertical panchromatic aerial photographs, 1:24,000 topographic maps, and SLAR data. Results showed that (1) radar has the potential to provide morphological and spatial data in urban areas, (2) with the available four images from dual-band, dual-polarized SLAR the exactness of the positive identification of the land-use groupings are, in a decreasing order - residential, industrial, open and other, transportation and utilities, commercial and services, and institutional, and (3) SLAR may be employed in the study of surface roughness changes relative to meteorological disasters. T.S.

**A75-17132 #** On the natural limitations of target differentiation by means of spectral discrimination techniques. M. J. Duggin (Commonwealth Scientific and Industrial Research Organization, Minerals Research Laboratories, North Ryde, New South Wales, Australia). In: *International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1.* Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 499-515.

The work described in this paper has been directed towards determining the minimum differences in detected target radiances necessary to exceed noise at the detector. This is caused by atmospheric fluctuations across the scene and by variations in directional reflectance across the target surface. Only when detected radiance differences exceed this noise can terrain classification be unambiguous. To achieve this aim, measurements have been made of global irradiance in the ERTS bandpasses for Sydney over a period of four months, and spectral global irradiance has been measured for Sydney in the range 400-1100 nm over a period of seven months and at Hobart during the winter solstice. (Author)

**A75-17134 #** Interactive computer processing for land use planning. E. E. Nelson (McDonnell Douglas Corp., Huntington Beach, Calif.). In: *International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceed-*

ings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 537-547.

A thematic mapping project is being performed featuring multispectral remote sensing, interactive computer analysis, and extensive participation by land use planners in Utah. A test site in the Salt Lake City area was flown in July 1973 with a McDonnell Douglas scanner and cameras. The organizations in Utah have organized in study groups for Land Use, Water Resources, Vegetation-Soils, Geology-Geomorphology, and Imagery. Interactive analysis of the data is being conducted with an XDS-930 computer, facilities for digitizing film or analog magnetic tape, black and white and color output display devices, and an alphanumeric terminal for operator communication with the computer. Computer classification results are being overlaid to standard base maps for final evaluation by the land use planners in Utah. (Author)

**A75-17135 \* #** Use of ERTS-1 imagery for land evaluation in Pennington County, South Dakota. C. J. Frazee, P. H. Rahn, F. C. Westin, and V. I. Myers (South Dakota State University, Brookings; South Dakota School of Mines, Rapid City, S.D.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 549-568. 7 refs. Grant No. NGL-42-003-007.

**A75-17151 #** Adaptive processing of MSS data using a decision-directed Kalman filter. R. B. Crane (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 781-791.

A decision-directed Kalman filter is shown to be applicable to adaptive processing of multispectral data. Improved recognition accuracy results from the use of the Kalman filter, and the improvement is relatively insensitive to filter parameters; e.g., updating rate. Approximately ten percent additional computer time is required. (Author)

**A75-17154 #** Modifications in a computer-implemented method for the detection and extraction of objects in aerial photographs. S. Klausner and D. Karmeli (Technion - Israel Institute of Technology, Haifa, Israel). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 825-836.

The K-S filter technique of picture segmentation has been used to detect and extract both man-made objects and terrain types from black and white aerial photographs. Several modifications of the filter are proposed, and their effect on filter performance is discussed. (Author)

**A75-17156 \* #** SICLOPS - A system of computer programs for rectified mapping of airborne scanner imagery. M. M. Spencer, J. M. Wolf, and M. A. Schall (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 853-864. Contract No. NAS9-9784.

This paper describes SICLOPS, a system of computer programs, which has been developed to perform geometrically corrected line-by-line mapping of airborne multispectral scanner data to ground coordinates and to estimate ground areas. As inputs, SICLOPS accepts aircraft attitude and positional information furnished by ancillary aircraft equipment, plus ground truth information giving the location, in map grid coordinates, of a number of recognizable

landmarks on the ground. The geometric correction and mapping procedure locates the scan lines, or the pixels on each line, in terms of map grid coordinates. The area estimation procedure gives ground area for each pixel or for a predesignated parcel specified in map grid coordinates. The results of exercising the system with simulated data showed the uncorrected video and corrected imagery and produced area estimates accurate to better than 99.7%. Real input data, though prepared, have not yet been processed by the system. (Author)

**A75-17191 #** Photographs from balloons - Their use in agronomy and management of environment. C. M. Girard-Ganneau and M. C. Girard (Institut National Agronomique Paris-Grignon, Thiverval-Grignon, Yvelines, France). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1467-1474. 7 refs.

The authors have studied photographs taken from stratospheric balloons during flights over the south-west of France. The first step made was to set up a glossary containing all the terms used to describe the landscape units. Afterwards the authors use the measures of rank distances to compare the units. At last some applications of interpretation of photographs from balloons, and of the treatment of the data are given. Two fields of application have been selected: agriculture, and thematic maps in different fields of specialization. (Author)

**A75-17193 #** Evaluation of ERTS data utilization in developing countries. E. J. Greenblat (ECON, Inc., Princeton, N.J.), D. S. Lowe (Michigan, Environmental Research Institute, Ann Arbor, Mich.), and R. A. Summers (System Planning Corp., Arlington, Va.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1509-1515.

This paper summarizes a study performed by the authors for USAID. ERTS imagery may be utilized by less developed countries for a broad range of applications, many of which appear to have significant economic benefits. The realization of the economic potential will depend in large measure upon the capability for organization of an ERTS applications program. These organizational aspects may be as important for a successful program as the technical capability to interpret the imagery. (Author)

**A75-17198 #** Deteriorating effects on 3 mm wave passive imagery. G. Schaerer and E. Schanda (Bern, Universität, Berne, Switzerland). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1593-1602.

A high resolution (10 arcminutes) microwave scanning radiometer with a real time display on a TV screen, operating at 3.3 mm wavelength has been used for thermal mapping. Radiometric images of characteristic soil signatures (snow and water) are presented and some special features are discussed. Deteriorated thermograms due to various atmospheric effects are presented. It is shown that the state of the cloud cover means a severe limitation of mapping of snow and water surfaces at 3 mm wavelength. (Author)

**A75-17199 #** The usefulness of imaging passive microwave for rural and urban terrain analysis. D. N. Brunelle, J. E. Estes, M. R. Mel, R. R. Thaman, F. E. Evanisko (California, University, Santa Barbara, Calif.), R. P. Moore, C. A. Hawthorne, and J. O. Hooper (U.S. Naval Weapons Center, China Lake, Calif.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1603-1620. 5 refs. Contract No. N00123-73-2352.



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In-depth ground truth data have been collected in conjunction with four microwave radiometer (MICRAD) flights. Images were evaluated to determine their information content in studies of the cities of Lost Hills, Coalinga, and Bakersfield, California. Results indicate that passive microwave radiometers can yield accurate information for general land use maps. In addition, the agricultural landscapes around Lost Hills and Coalinga were imaged. In all analyses, emphasis has been placed on problems of target recognition and identification in order to build a background of known MICRAD tone signatures. Preliminary analysis indicates that, while most conventional remote sensing systems have shown considerable utility in terrain analyses, the MICRAD system may add information concerning specific terrain phenomena unavailable from conventional sensor systems. (Author)

**A75-17202 \* #** Electrically scanning microwave radiometers. R. F. Mix (Aerojet ElectroSystems Co., Azusa, Calif.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1649-1655. Contracts No. NAS5-21115; No. NAS5-21635.

The electrically scanning microwave radiometer (ESMR) developed for and currently used onboard the Nimbus 5 meteorological satellite is described, along with the ESMR developed for the Nimbus F satellite. They serve for synoptic mapping of microwave emissions from the earth's surface, the instrument on Nimbus 5 measuring these emissions at a wavelength of 1.55 cm (19.35 GHz) and the instrument on Nimbus F, at a wavelength of 0.81 cm (37 GHz). Radiative transfer characteristics measured at these wavelengths are sufficiently different from IR measurements to permit derivation and interpretation of unique meteorological, geomorphological, and oceanographic data. V.P.

**A75-17218 #** Geothermal reconnaissance from quantitative analysis of thermal infrared images. K. Watson (U.S. Geological Survey, Denver, Colo.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1919-1932. 28 refs.

**A75-17219 \* #** Optical data processing analysis of stream patterns exhibited on ERTS-1 imagery. D. Egbert, J. McCauley, F. Ulaby, and J. McNaughton (University of Kansas Center for Research, Inc., Lawrence, Kan.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1933-1951. 11 refs. Contract No. NAS5-21822.

The purpose of the investigation described in this paper has been the analysis of large-scale geologic ground patterns in Kansas using ERTS-1 imagery and optical data processing techniques. Optical spatial frequency data provide a repeatable quantitative means of specifying ground pattern characteristics. (Author)

**A75-18052** American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1974. 460 p. Members, \$2.50; nonmembers, \$5.00.

Topics discussed include the use of a photomapper to produce orthophotographs and height information, a two-level resource-oriented land use classification system for use with remote sensor data, the use of ERTS imagery in regional land use planning, application of the four-color process printing technique to the production of aeronautical maps and charts, a new multilayer mapping system for land use decisions, the use of high-altitude photography and ERTS-1 imagery for mapping wildlife habitats over

extensive areas, the use of ERTS imagery in mapping the trophic level of inland lakes, the use of ERTS-1 imagery in the planning and development of natural resources, a multiple-image processing system to facilitate the extraction of terrain information, the use of small-scale color infrared film for the purpose of soil mapping, and the use of thermal infrared imagery in computerized object identification.

A.B.K.

**A75-19268** The application of pattern classification techniques to Skylark earth resources rocket imagery. E. S. Owen-Jones, I. R. Galloway, and B. J. Chandler (Bedford College, London, England). In: Conference on Environmental Sensors and Applications, London, England, November 18, 19, 1974, Proceedings. London, Institution of Electronic and Radio Engineers, 1974, p. 81-89.

A supervised learning method has been applied to an infra-red false-color image of part of Central Argentina which was obtained by means of a Skylark sounding rocket. The principal field types have been classified, and a separation of the main crop-type, sorghum, into two stages of maturity has been attempted. (Author)

**N75-10202#** Rhode Island Univ., Kingston. Dept. of Chemistry.

**LASER RAMAN SPECTROSCOPY OF SOLUTES DISSOLVED IN WATER FROM A REMOTE PLATFORM** Completion Report, 1 Jul. 1971 - 31 Jan. 1974

Christopher W. Brown 31 Jan. 1974 19 p refs

(Contract DI-14-31-0001-3641)

(PB-233432/4; W74-09255; OWRR-B-036-RI(4)) Avail: NTIS. HC \$3.00 CSCL 07B

An optical system for obtaining remote Raman spectra of ionic solutes dissolved in water was built and tested. At present, the system has been used to detect and identify 150 ppm of NO<sub>3</sub><sup>-</sup> at a distance of 21 ft. Furthermore, the same system has been used to detect oil slicks on the surface of water, and dissolved SO<sub>4</sub><sup>-</sup>(-2), PO<sub>4</sub><sup>-</sup>(-3), and CO<sub>3</sub><sup>-</sup>(-2). GRA

**N75-10425#** Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

**A RADAR ALTIMETER FOR SATELLITE APPLICATION**

J. L. MacArthur Oct. 1973. 38 p refs

(Contract N00017-72-G-4401)

(AD-784373; APL-TG-1226) Avail: NTIS CSCL 14/2

A number of satellite radar altimeter designs have been proposed for the purpose of remotely sensing ocean surface parameters. A precision goal of 10 cm is commonly stated to fulfill the major desires of geodesy and oceanography. An altimeter design approach is discussed that requires only a few watts of peak transmit power, a particular advantage in satellite use. A burst programmed, phase-coded waveform is proposed with an effective compression ratio of 4096, which allows a significant power reduction over previous designs. A design capable of implementation with proven devices is achieved, requiring no new developments. At the same time, flexibility is achieved, and several variations of the basic waveform are discussed with differing levels of performance, complexity, and power consumption. Author (GRA)

**N75-10526\*#** Cornell Univ., Ithaca, N.Y.

**EVALUATION OF SKYLAB IMAGERY AS AN INFORMATION SERVICE FOR INVESTIGATING LAND USE AND NATURAL RESOURCES** Monthly Progress Report, Jul. 1974

Ernest Hardy, Principal Investigator, James Skaley, and Elmer Phillips 31 Jul. 1974 3 p Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP

(Contract NAS9-13364)

(E74-10730; NASA-CR-139576) Avail: NTIS HC \$3.25 CSCL 08B

**N75-10527\*#** Environmental Research Inst. of Michigan, Ann Arbor.

**DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, Sep. 1974**

Richard F. Nalepka and William A. Malila, Principal Investigators.  
14 Oct. 1974 5 p EREP  
(Contract NAS9-13280)  
(E74-10799; NASA-CR-140493; ERIM-101900-40-L) Avail:  
NTIS HC \$3.25 CSCL 05B

**N75-10531\*#** Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

**AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES Monthly Progress Report, Sep. 1974**

Roger M. Hoffer, Principal Investigator Sep. 1974 5 p EREP  
(Contract NAS9-13380)  
(E74-10803; NASA-CR-140497) Avail: NTIS HC \$3.25 CSCL 08F

**N75-10570\*#** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Tex.

**JSC EARTH RESOURCES DATA ANALYSIS CAPABILITIES AVAILABLE TO EOD REVISION B**

Jun. 1974 55 p Prepared by Lockheed Electron. Co.  
(Contract NAS9-12200)  
(NASA-TM-X-72029; LEC-3949) Avail: NTIS HC \$4.25 CSCL 05B

A list and summary description of all Johnson Space Center electronic laboratory and photographic laboratory capabilities available to earth resources division personnel for processing earth resources data are provided. The electronic capabilities pertain to those facilities and systems that use electronic and/or photographic products as output. The photographic capabilities pertain to equipment that uses photographic images as input and electronic and/or table summarizes processing steps. A general hardware description is presented for each of the data processing systems, and the titles of computer programs are used to identify the capabilities and data flow. Author

**N75-11419\*#** Scientific Translation Service, Santa Barbara, Calif. **SPACE ICONICS**

B. N. Radionov, ed., Ya. L. Ziman, ed., A. A. Izotov, ed., V. I. Pavlov, ed., T. P. Popova, ed., and Yu. M. Chesnokov, ed. Washington NASA Sep. 1974 289 p refs Transl. into ENGLISH of the publ. "Kosmicheskaya Ikonika" Moscow, Nauka Press, 1973 240 p  
(Contract NASw-2483)

(NASA-TT-F-798) Avail: NTIS HC \$8.75 CSCL 14C

A broad range of questions of space iconics and iconology are covered, beginning with methodological questions and the definitions of these terms. The papers on iconology examine the questions of determining spacecraft orientation, techniques and equipment for transforming and correlating television and IR pictures of the earth, geological, geophysical, and geographical interpretation of pictures taken from space, questions of machine interpretation of cloud images obtained from space.

**N75-11425\*#** Scientific Translation Service, Santa Barbara, Calif. **GEOMETRIC DISTORTIONS OF OPTICOMMERCIAL PANORAMIC TELEVISION SYSTEMS**

V. M. Govorov *In its Space Iconics* (NASA-TT-F-798) Sep. 1974 p 51-59 refs Transl. into ENGLISH of the publ. "Kosmicheskaya Ikonika" Moscow, Nauka Press, 1973 p 44-51  
CSCL 09F

One of the problems solvable by the spaceborne television system, topographical surveying, makes high demands on image quality, particularly on the geometric distortions introduced by the television camera. It is the geometric distortions which determine measurement accuracy and, consequently, the possibility of creating reliable planetary surface maps. Comparative analysis of the different television systems capable of solving the problem showed that the requirements on quality of the transmitted images are best satisfied by television cameras with optomechanical scanning. The design of panoramic television systems and the process of image construction by the optomechanical camera are discussed. Results indicate that panoramic television cameras have the necessary instrumental accuracy and permit determination of the direction to objects with an error practically equal to the resolution. Author

**N75-11483#** Army Foreign Science and Technology Center, Charlottesville, Va.

**USE OF A DIGITAL COMPUTER TO CONSTRUCT ISOLINE MAPS BASED ON A STEREOMODEL OF TERRAIN**

V. M. Zaitsev, V. S. Lavrova, and A. A. Chigirev 18 Apr. 1974 12 p refs Transl. into ENGLISH from *Geodeziya i Kartografiya* (USSR), no. 4, 1973 p 48-53  
(AD-784170; FSTC-HT-23-0276-74) Avail: NTIS CSCL 08/5

A new method of constructing isolines in accordance with an altitude matrix given within the nodes of a grid is proposed. The algorithm for this method was applied in a subsystem including an input device, a control digital computer, and an output device. If a Dnepr-1 computer is used, all the isolines on a map measuring 200 x 300 mm with a 0.2 mm stride can be plotted in about 3 hours, but the time can be shortened by several times if more highly advanced equipment is used. GRA

**N75-11502** World Meteorological Organization, Geneva (Switzerland).

**METHODS FOR THE AUTOMATIC RECORDING OF ATMOSPHERIC DUST CONCENTRATIONS AND SOME OF THE RESULTS OBTAINED**

N. N. Aleksandrov, S. A. Konkov, and G. S. Gunija *In its Observation and Meas. of Atmospheric Pollution* 1974 p 257-264 refs

The photometric and radiometric processes of determining the quantities of atmospheric dust deposited on filters are summarized, and the characteristics of various types of filters are noted. A photometric method utilizing a sampling device which draws air through a tape filter is described, and results are given of gravimetric and photometric analyses of the dust. ESRO

**N75-11504** World Meteorological Organization, Geneva (Switzerland).

**AIRCRAFT MEASUREMENTS OF THE CONCENTRATION AND SIZE DISTRIBUTION OF ATMOSPHERIC SULFATE PARTICLES**

E. Meszaros *In its Observation and Meas. of Atmospheric Pollution* 1974 p 276-281 refs

A simple set of aircraft collectors designed to capture aerosol particles in three size ranges for subsequent chemical analysis is described. The preliminary results concerning the size distribution of sulfate particles at different levels of the lower troposphere are also presented. ESRO

## 07 DATA PROCESSING AND DISTRIBUTION SYSTEMS

### **N75-11551\*** Akademiya Nauk SSSR, Novosibirsk. **SOLUTION OF THE RADIATIVE TRANSFER THEORY PROBLEMS BY THE MONTE CARLO METHOD**

G. I. Marchuk and G. A. Mikhailov / In Calif. Univ. Proc. of the UCLA Intern. Conf. on Radiation and Remote Probing of the Atmosphere 1974 p 58-73 refs

CSCL 04A

The Monte Carlo method is used for two types of problems. First, there are interpretation problems of optical observations from meteorological satellites in the short wave part of the spectrum. The sphericity of the atmosphere, the propagation function, and light polarization are considered. Second, problems dealt with the theory of spreading narrow light beams. Direct simulation of light scattering and the mathematical form of medium radiation model representation are discussed, and general integral transfer equations are calculated. The dependent tests method, derivative estimates, and solution to the inverse problem are also considered. J.A.M.

**N75-11571#** National Environmental Satellite Service, Washington, D.C.

### **ENVIRONMENTAL SATELLITE IMAGERY, SEPTEMBER 1974 Key to Meteorological Records Documentation no. 5.4**

Sep. 1974 95 p refs

Avail: NTIS HC \$4.75

Composites are presented for the Northern and Southern Hemispheres. These were prepared from data swaths by a scanning radiometer on the NOAA 2 satellite. Author

**N75-12279\*** Lockheed Electronics Co., Houston, Tex. Aerospace Systems

### **CORRELATION OF MISSIONS 191, 51M AND HELICOPTER PHOTOGRAPHY**

B. A. Bryan and S. H. Tunnel Aug. 1972 43 p

(Contract NAS9-12200)

(NASA-CR-134289; EOD2876; TWP-72-004) Avail: NTIS HC \$3.75 CSCL 14E

The data obtained during aerial photography flights using a helicopter are presented. The areas photographed are identified as three areas within Test Site 175: (1) Rosenberg, (2) Houston Ship Channel/Trinity Bay, and (3) the Somerville Dam. Data are presented in the form of charts. Reproductions of the aerial photographs are included. Author

**N75-12409\*** Environmental Research Inst. of Michigan, Ann Arbor.

### **DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, Oct. 1974**

Richard F. Nalepka and William A. Malifa, Principal Investigators 14 Nov. 1974 4 p EREP

(Contract NAS9-13280)

(E75-10040; NASA-CR-140777; ERIM-101900-42-L) Avail: NTIS HC \$3.25 CSCL 05B

**N75-12412\*** Colorado School of Mines, Golden. Dept. of Geology.

### **GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO, USING SKYLAB EREP DATA Monthly Progress Report, Oct. 1974**

Keenan Lee, Principal Investigator 15 Nov. 1974 4 p EREP (Contract NAS9-13394)

(E75-10043; NASA-CR-140780) Avail: NTIS HC \$3.25 CSCL 08G

**N75-12417\*** Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.

### **NEW THEORETICAL MODELS AND RATIO IMAGING TECHNIQUES ASSOCIATED WITH THE NASA EARTH RESOURCES SPECTRAL INFORMATION SYSTEM Technical Report, 1 Feb. 1973 - 31 Jan. 1974**

R. K. Vincent Jul. 1974 116 p refs

(Contract NAS9-9784)

(NASA-CR-140357; ERIM-190100-30-T) Avail: NTIS HC \$5.25 CSCL 05B

Four independent investigations are reported; in general these are concerned with improving and utilizing the correlation between the physical properties of natural materials as evidenced in laboratory spectra and spectral data collected by multispectral scanners. In one investigation, two theoretical models were devised that permit the calculation of spectral emittance spectra for rock and mineral surfaces of various particle sizes. The simpler of the two models can be used to qualitatively predict the effect of texture on the spectral emittance of rocks and minerals; it is also potentially useful as an aid in predicting the identification of natural atmospheric aerosol constituents. The second investigation determined, via an infrared ratio imaging technique, the best pair of infrared filters for silicate rock-type discrimination. In a third investigation, laboratory spectra of natural materials were compressed into 11-digit ratio codes for use in feature selection, in searches for false alarm candidates, and eventually for use as training sets in completely automatic data processors. In the fourth investigation, general outlines of a ratio preprocessor and an automatic recognition map processor are developed for on-board data processing in the space shuttle era. Author

**N75-12420\*** Control Data Corp., Minneapolis, Minn.

### **CORRELATION AND REGISTRATION OF ERTS MULTI-SPECTRAL IMAGERY**

L. O. Bonrud and P. J. Henrikson Apr. 1974 127 p refs

(Contract NAS9-13114)

(NASA-CR-134294) Avail: NTIS HC \$5.25 CSCL 05B

Examples of automatic digital processing demonstrate the feasibility of registering one ERTS multispectral scanner (MSS) image with another obtained on a subsequent orbit, and automatic matching, correlation, and registration of MSS imagery with aerial photography (multisensor correlation) is demonstrated. Excellent correlation was obtained with patch sizes exceeding 16 pixels square. Qualities which lead to effective control point selection are distinctive features, good contrast, and constant feature characteristics. Results of the study indicate that more than 300 degrees of freedom are required to register two standard ERTS-1 MSS frames covering 100 by 100 nautical miles to an accuracy of 0.6 pixel mean radial displacement error. An automatic strip processing technique demonstrates 600 to 1200 degrees of freedom over a quarter frame of ERTS imagery. Registration accuracies in the range of 0.3 pixel to 0.5 pixel mean radial error were confirmed by independent error analysis. Accuracies in the range of 0.5 pixel to 1.4 pixel mean radial error were demonstrated by semi-automatic registration over small geographic areas. Author

**N75-12422\*** Electromagnetic Systems Labs., Sunnyvale, Calif. IMAGE SELECTION SYSTEM

M. A. Knutson, Donald Hurd, Larry Hubble, and Richard M. Kroeck Washington NASA Nov. 1974 98 p ref

(Contract NAS2-7064)

(NASA-CR-2475; ESL-TM-456) Avail: NTIS HC \$4.75 CSCL 05B

An image selection (ISS) was developed for the NASA-Ames Research Center Earth Resources Aircraft Project. The ISS is an interactive, graphics oriented, computer retrieval system for aerial imagery. An analysis of user coverage requests and retrieval strategies is presented, followed by a complete system description. Data base structure, retrieval processors, command language, interactive display options, file structures, and the system's capability to manage sets of selected imagery are described. A detailed example of an area coverage request is graphically presented. Author

**N75-13335\*#** Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

**USE OF FEATURE EXTRACTION TECHNIQUES FOR THE TEXTURE AND CONTEXT INFORMATION IN ERTS IMAGERY: SPECTRAL AND TEXTURAL PROCESSING OF ERTS IMAGERY** Final Report, 1 Aug. 1972 - 17 Mar. 1974

Robert H. Haralick, Principal Investigator and Robert J. Bosley 17 Mar. 1974 99273 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS (Contract NAS5-21822) (E75-10011; NASA-CR-140655) Avail: NTIS HC \$8.50 CSCL 05B

The author has identified the following significant results. A procedure was developed to extract cross-band textural features from ERTS MSS imagery. Evolving from a single image texture extraction procedure which uses spatial dependence matrices to measure relative co-occurrence of nearest neighbor grey tones, the cross-band texture procedure uses the distribution of neighboring grey tone N-tuple differences to measure the spatial interrelationships, or co-occurrences, of the grey tone N-tuples present in a texture pattern. In both procedures, texture is characterized in such a way as to be invariant under linear grey tone transformations. However, the cross-band procedure complements the single image procedure by extracting texture information and spectral information contained in ERTS multi-images. Classification experiments show that when used alone, without spectral processing, the cross-band texture procedure extracts more information than the single image texture analysis. Results show an improvement in average correct classification from 86.2% to 88.8% for ERTS image no. 1021-16333 with the cross-band texture procedure. However, when used together with spectral features, the single image texture plus spectral features perform better than the cross-band texture plus spectral features, with an average correct classification of 93.8% and 91.6%, respectively.

**N75-13336\*#** Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.

**EVALUATION OF SKYLAB IMAGERY AS AN INFORMATION SERVICE FOR INVESTIGATING LAND USE AND NATURAL RESOURCES** Progress Report, Oct. 1974

Ernest E. Hardy, Principal Investigator 31 Oct. 1974 12 p EREP

(Contract NAS9-13364)

(E75-10013; NASA-CR-140651) Avail: NTIS HC \$3.25 CSCL 08B

**N75-13347\*#** Nebraska Univ., Lincoln. **USE OF ERTS-1 IMAGERY TO INTERPRET WIND-EROSION HAZARD IN THE SANDHILLS OF NEBRASKA**

James V. Drew, Principal Investigator; Paul M. Seevers, and David T. Lewis 22 Nov. 1974 16 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(Contract NAS5-21756)

(E75-10044; NASA-CR-140781) Avail: NTIS HC \$3.25 CSCL 08F

**N75-13367\*#** Scientific Translation Service, Santa Barbara, Calif. **FROM AEROSPACE PHOTOGRAPHS TO FORECASTING AND CALCULATING FLOWS**

G. P. Kalinin Washington NASA Dec. 1974 63 p refs Transl. into ENGLISH from the book "Ot Aerokosmicheskikh Snimkov k Prognozam: Raschetam Stoka" Leningrad, Hydrometeorological Press, 1974 p 1-41

(Contract NASw-2483)

(NASA-TT-F-16006) Avail: NTIS HC \$4.25 CSCL 08E

A theoretical basis is provided for using hydrological data obtained by remote measurements (from spacecraft and aircraft).

Methods of calculating flow and the characteristics of the snow cover are suggested, based on photographs that characterize the dynamics of the hydrological processes that occur on the surfaces of river basins. Problems are posed of experimental investigations leading to new possibilities of analysis and calculation of a number of hydrological elements. Author

**N75-14187\*#** Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.

**EVALUATION OF SKYLAB IMAGERY AS AN INFORMATION SERVICE FOR INVESTIGATING LAND USE AND NATURAL RESOURCES** Progress Report, Nov. 1974

Ernest E. Hardy, Principal Investigator 30 Nov. 1974 1 p EREP

(Contract NAS9-13364)

(E75-10068; NASA-CR-141022) Avail: NTIS HC \$3.25 CSCL 05B

**N75-14189\*#** Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

**DESIGN DATA COLLECTION WITH SKYLAB/EREP MICROWAVE INSTRUMENT S-193** Monthly Letter Progress Report No. 12, Sep. 1974

Arun Sobti, Richard K. Moore, Fawwaz T. Ulaby, John C. Barr, Evan Davison, Chia Sung, Saad Ulaby, and Tom Burton Sep. 1974 4 p EREP

(Contract NAS9-13331)

(E75-10070; NASA-CR-141101) Avail: NTIS HC \$3.25 CSCL 05B

**N75-14217** Bochum Observatory (West Germany). Inst. for Space Research.

**ENVIRONMENTAL SATELLITES AND ERTS-1 IMAGERY** H. Kaminski and Anne-Marie Martin In ESRO European Earth-Resources Satellite Expts. May 1974 p 1-19 refs Original contains color illustrations

The application of environmental satellite data to complement ERTS-1 imagery is discussed. The first Earth Resources Technology Satellite was conceived as a non-meteorological system with a long period of repetitive coverage (18 days) and sensor bandwidths in the range of visible light and photographic infrared. Since the start of ERTS-1, it has been found necessary to complement this concept with synoptic visible and infrared imagery from environmental satellites, such as Nimbus-3 and NOAA-2. The use of this high resolution imagery is demonstrated for the recognition of thermal phenomena such as warm and cold currents in coastal seas, definition of differing layers in the atmosphere, and delineation of urban hot spots. Available examples of ERTS imagery are compared with the above to illustrate the compatibility of these sensor systems for geoscientific research. ESRO

**N75-14218** Zentralstelle fuer Geo-Photogrammetrie und Fernerkundung, Munich (West Germany).

**EVALUATION OF ERTS-1 DATA BY ANALOGUE AND DIGITAL TECHNIQUES**

J. Bodechtel, R. H. Dittel, and R. Haydn In ESRO European Earth Resources Satellite Expts. May 1974 p 21-35 Original contains color illustrations

Digital and analog image evaluation was performed on ERTS-1 data representing a Central European summer scene and a North Italian winter scene. A statistical analysis of the data, as first step in the evaluation process, showed strong correlation between both infrared channels for these types of landscape and these seasonal periods. For representative areas south of the Starnberg Lake near Munich, different features such as water, conifer forests, agricultural areas and particular soil category were identified by applying factor analysis. Feature identification was also performed by a digital quick-look method which considers the slope between the intensity levels for the channels of the visible and infrared spectrum caused by different reflection properties of surfaces.

## 07 DATA PROCESSING AND DISTRIBUTION SYSTEMS

The results obtained digitally are compared with those obtained by analog density slicing. A hardware concept for an interactive hybrid image evaluation system is presented. Author (ESRO)

**N75-14219** Research Inst. of National Defence, Stockholm (Sweden).

### **PROCESSING OF ERTS CCT IMAGERY OF SWEDEN. A PILOT STUDY**

T. Orhaug and S. I. Aakersten /In ESRO European Earth-Resources Satellite Expts. May 1974 p 37-45 Original contains color illustrations

Data handling, processing, and presentation problems are discussed in connection with a Swedish remote sensing program aimed at natural resources inventories and environmental monitoring. For want of large quantities of remotely sensed national data suitably recorded for automatic processing and analysis, ERTS-1 CCT's of Swedish scenes were acquired as a means of making an inventory of forest-rejuvenation areas. In addition to standard methods of computer imagery generation, a technique developed in Sweden is used. An ink-jet plotter yields a 3 color image on ordinary paper. Examples of imagery from ERTS-1 recordings are presented. ESRO

**N75-14220** Sheffield Univ. (England). Dept. of Geography. **AN EVALUATION OF STEREOSCOPIC VIEWING OF ERTS AND SKYLAB IMAGES**

J. L. VanGenderen /In ESRO European Earth-Resources Satellite Expts. May 1974 p 47-55 refs Original contains color illustrations

It is shown that stereoscopic examination of orbital data can contribute to studies of spatial, spectral, and temporal variations on the imagery. The combination of true stereo parallax plus shadow parallax offers many possibilities to human interpreters for making meaningful analyses of orbital imagery. Using the procedures of stereoscopic image interpretation described, many earth scientists who have neglected the important information source that ERTS and Skylab data can be, because of their lack of expensive data-analysis equipment, should be encouraged to use the data with simple stereoscopic instruments and the analysis techniques defined. Author (ESRO)

**N75-14221** Hunting Surveys, Ltd., Boreham-Wood (England). **THE POTENTIAL OF SMALL-SCALE MAPPING FROM ERTS-1 IMAGERY**

H. Chisman /In ESRO European Earth-Resources Satellite Expts. May 1974 p 57-59

Comparison tests are to be made between existing mapping, the accuracy and completeness of which can be relied upon, and that obtained directly from ERTS imagery with a minimum of control. By comparing satellite coverage and existing mapping the completeness of detail that can be interpreted, and the locational accuracy of interpreted detail can be examined. The effectiveness of the different spectral band images for the interpretation of different features will be evaluated and also photogrammetric and image enhancement techniques applied to the imagery that may be useful in map printing. If satisfactory results are obtained from these studies, the techniques will be applied to mapping in those parts of the world where present maps are inadequate. Author (ESRO)

**N75-14222** International Training Centre for Aerial Survey, Delft (Netherlands).

### **THE ITC 8-IMAGE COMPARATOR AND ITS POSSIBLE USE IN ERTS AND EREP INVESTIGATIONS**

S. A. Hempenius /In ESRO European Earth-Resources Satellite Expts. May 1974 p 61-70 refs

A multi-image projector is described for ERTS and EREP imagery. The single-lamp viewer projects up to eight, three times enlarged, 60 mm by 60 mm transparencies through one objective onto an almost horizontal table-top screen. Used as a color additive viewer, any subset of the eight multispectral images can be presented; the intensity and color of the individual images can be selected independently (red, green, blue, or white). In the flickering mode, the series of single images, or of pairs,

triplets, etc. can be thrown onto the screen in slow or rapid succession (frequency adjustable up to 30 Hz), the time constant of the shutters being about 5 msec. The number of images per cycle (1 to 8), the presentation time per image, the temporal overlap of the images, the color, and the intensity can be set independently. Visual faculties to be explored for discrimination and identification on multispectral and multi-temporal ERTS images include color viewing, detection of flickering fields, and disappearance of fluctuations when passing the critical flicker frequency. Author (ESRO)

**N75-14223** Institut de Geographie, Aix en Provence (France). Centre de Teledetection.

### **OPTICAL PROCESSING OF ERTS-1 (MSS) IMAGES: EXAMPLES FOR THE ARCACHON BASIN AND RHONE DELTA**

J. Pouquet, J. O. Palgen (Earth Satellite Corp., Washington, D.C.), and P. A. Rey (Toulouse Univ.) /In ESRO European Earth-Resources Satellite Expts. May 1974 p 71-74 Original contains color illustrations

Conventional examples showing the possibilities of density slicing or color-composite techniques are presented. It is emphasized, however, that these old procedures should only be used as a first approach; only correct digitization (reflectance, radiance temperature values according to wavelength) is likely to yield valuable scientific results. Author (ESRO)

**N75-14225** Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).

### **REDUCTION OF INFORMATION REDUNDANCY IN ERTS-1 AND EREP DATA. A PROPOSAL FOR AN EXPERIMENTAL STUDY**

D. Davidts and A. Loeffler (Ges. fuer Weltraumforsch.) /In ESRO European Earth-Resources Satellite Expts. May 1974 p 81-91 refs

An experiment is discussed for measuring the information density of remotely sensed data collected from different altitudes (low-flying aircraft, high-altitude aircraft, Spacelab, ERTS, EREP) and for determining the redundancy with respect to the final output of the interpreter and his information needs and processing capabilities. Author (ESRO)

**N75-14229** Swiss Inst. of Meteorology, Zurich.

### **METEOROLOGICAL INTERPRETATION OF HIGH RESOLUTION IMAGES FOR REMOTE SENSING OF EARTH RESOURCES [INTERPRETATION METEOROLOGIQUE DES IMAGES A HAUTE RESOLUTION DESTINEES A LA TELEDTECTION DES RESSOURCES TERRESTRES]**

A. Piaget /In ESRO European Earth-Resources Satellite Expts. May 1974 p 135-141 refs In FRENCH; ENGLISH summary

It is shown that remote sensing of earth resources is very valuable to meteorology, because the very high-image-resolution required for remote sensing (less than 100 m) enables a study to be made of the microstructure of clouds over a relatively wide area. Another application makes use of the fine detail of the temperature distribution field. It is often possible to study the penetration of air from the plain into the valleys, or the stagnation of cold air in the dips in the ground surface. This is useful information for the protection of the environment and for the planting of new crops, to give only two examples. The extent of the snow cover and its effect on the neighboring air can only be appreciated by studying both ordinary and very high resolution images in combination. Author (ESRO)

**N75-14242** Louvain Univ. (Belgium). Inst. of Earth-Sciences. **PRELIMINARY EVALUATION OF ERTS-1 IMAGERY OF CENTRAL AFRICA**

J. Sterckx and J. DePloey /In ESRO European Earth Resources Satellite Expts. May 1974 p 289-295 refs

The investigation was conducted using black and white ERTS-1 imagery, both transparencies and contact paper prints. The Mweru Wantipa swamp, situated between Lake Tanganyika and Lake Mweru, appears on the ERTS imagery as an important lake, bordered on all sides by fault scarps. Only a few features of human presence could be recognized. The parallelism of the rivers on the Kwango plateau is disturbed by a system of grabens, north of Feshi. These are not marked on the geological map. Remains of a forest on the divides permit an evaluation of human density. A large area around the Itimbiri-Zaire confluence was examined on the ERTS imagery in order to propose a geographical division based on the coincidence and possible relationships of particular physical and human features.

Author (ESRO)

**N75-14243** Louvain Univ. (Belgium).

**PEDOLOGICAL INTERPRETATION OF ERTS-1 IMAGERY OF THE RIMA-SOKOTO RIVER BASIN (N. NIGERIA)**

R. Gombeer and J. d'Hooe. In ESRO European Earth Resources Satellite Expts. May 1974 p 297-301 refs

Ground truth data were compared with two adjacent ERTS-1 MSS scenes, covering an area roughly located between 4 deg and 7 deg E and 12 deg and 13 deg 30 min N. These 100% cloudless scenes were recorded one month after the monthly rainfall had dropped sharply. Some variation in plant available ground water and in plant cover could therefore be expected and the reflections of the vegetation, together with those characteristic of soil surfaces under different physical conditions, should give rise to recognizable features. By projection of positive transparencies, meaningful enlargements up to a scale of 1:1000,000 could be obtained. MSS bands 5, 6 and 7 in particular yielded good pictures of drainage patterns and other geomorphologic features, and excellent correlation was observed with the 1:5000,000 scale geomorphological map of the area by Sombroek and Zonneveld.

Author (ESRO)

**N75-14249** Overseas Development Administration, Surrey (England). Land Resources Div.

**A COMPARISON OF ERTS IMAGERY WITH CONVENTIONAL AERIAL PHOTOGRAPHY FOR LAND-RESOURCE SURVEYS IN LESS DEVELOPED COUNTRIES. EXAMPLES FROM THE RIFT VALLEY LAKES BASIN, ETHIOPIA**

R. B. King and A. Blair-Rains. In ESRO European Earth Resources Satellite Expts. May 1974 p 371-379 refs

The extent to which ERTS imagery can aid land resource surveys in less developed countries was analyzed, with particular regard to: (1) multiband imagery; (2) recent and repetitive imagery; (3) mapping; (4) relief estimation; (5) detail; (6) synoptic viewing; and (7) color composites. These aspects are compared with the data revealed by panchromatic aerial photography. The analysis was carried out within the framework of a conventional land resource survey on a limited budget, and examples are mainly taken from one such survey within the Rift Valley Lakes Basin, Ethiopia. The main conclusions are the ERTS imagery is a significant aid to map production in areas where the present map coverage is poor, but its scale is too small for any detailed analysis. The synoptic aspect of ERTS imagery, however, is useful, particularly as a false-color composite. The ability to monitor changes in hydrology and agriculture is also advantageous.

Author (ESRO)

**N75-14255#** Army Foreign Science and Technology Center, Charlottesville, Va.

**INVESTIGATION OF ACCURACY OF DETERMINATION OF PLANE COORDINATES BY MEANS OF THE CENTRAL SCIENTIFIC RESEARCH INSTITUTE OF GEODESY, AERIAL PHOTOGRAPHY AND CARTOGRAPHY AIRBORNE RANGE-FINDER**

I. L. Gill, K. N. Gertsanova, and B. A. Batamanovskii. 19 Nov. 1973 13 p refs. Transl. into ENGLISH from Geod. Kartografiya (USSR), no. 3, 1972 p 37-44 (AD-785886; FSTC-HT-23-1270-73) Avail: NTIS CSCL 08/5

To answer the question of the possibility of using an airborne range finder (ARR) in topographic surveys on a 1:10,000 scale, and to choose the optimum technology of operations, experimental investigations were carried out on the accuracy of creating a radio-geodetic plane base by a method using the ARR. GRA

**N75-14257#** Army Foreign Science and Technology Center, Charlottesville, Va.

**WORK DEALING WITH DENSIFICATION OF ALTIMETRIC-PLANOMETRIC DATA POINTS EMPLOYING UNIVERSAL INSTRUMENTS AND RADIO ALTIMETER AND STATOSCOPIC INDICATIONS**

N. L. Borodin. 25 Jul. 1974 13 p. Transl. into ENGLISH from Geodez. i Kartograf. (Moscow), no. 11, 1969 p 46-52 (AD-785877; FSTC-HT-23-780-72) Avail: NTIS CSCL 08/2

Experimental work is reported on the photogrammetric densification of altimetric-planometric data. The photography studied was on a scale of 1:10,000 with a relief profile of 2.5 meters. The construction of photogrammetric grids, the geodetic orientation, and grid linking are discussed. Evaluation results of the study are tabulated. F.O.S.

**N75-15101\*** Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

**REFORMATTING SKYLAB AND MSS DATA OVER NORTH-ERN INDIANA Monthly Report, Nov. 1974**

LeRoy F. Silva, Principal Investigator. Nov. 1974 1 p EREP (Contract NAS9-13301)

(E75-10016; NASA-CR-140847) Avail: NTIS HC \$3.25 CSCL 05B

**N75-15102\*** Environmental Research Inst. of Michigan, Ann Arbor.

**DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, Nov. 1974**

Richard F. Nalepka and William A. Malila, Principal Investigators. 18 Dec. 1974 5 p ref EREP (Contract NAS9-13280)

(E75-10082; NASA-CR-141106; ERIM-101900-44-L) Avail: NTIS HC \$3.25 CSCL 05B

**N75-15127\*** Louisiana State Univ., Baton Rouge. Div. of Engineering Research.

**THE USE OF COLOR INFRARED IMAGERY FOR THE STUDY OF MARSH BUGGY TRACKS**

Charles A. Whitehurst and Linda N. Doiron. [1974] 13 p refs. Original contains color illustrations (Grant NGL-19-001-105)

Avail: NTIS HC \$3.25 CSCL 08H

Color infrared imagery is used to determine the location of buggy routes and to quantify the extent of tracks in a selected area where the marsh is seriously dissected. The imagery is used to show successive stages of destruction. It is recommended that alternate routes be identified in the operating area to eliminate continuous use of the same route and facilitate faster revegetation.

Author

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## 08

## INSTRUMENTATION AND SENSORS

Includes data acquisition and camera systems and remote sensors.

**A75-10075** Performance comparison of techniques for obtaining stereo radar images. G. L. Bair and G. E. Carlson (Missouri, University, Rolla, Mo.). *IEEE Transactions on Geoscience Electronics*, vol. GE-12, Oct. 1974, p. 114-122. Contract No. N00014-69-A-0141-0008. NR Project 387-069.

Three stereo radar imaging techniques namely, (1) an improved single flight technique, (2) a previously proposed single flight technique, and (3) a two-flight technique, are compared with respect to both theoretical performance and performance in the presence of errors. The theoretical data for the comparison of performance-affecting image parameters have been generated by computer simulation of the imaging geometries involved. The comparison shows that the improved single flight technique yields the best error performance for the assumed set of system errors. M.V.E.

**A75-10434** A technology to renovate the search for new mineral deposits. J. T. Awald (Denver Mineral Exploration Corp., Denver, Colo.). (*American Society of Photogrammetry, Annual Convention, St. Louis, Mo., Mar. 11, 1974.*) *Photogrammetric Engineering*, vol. 40, Oct. 1974, p. 1173-1186.

Two commercial applications of remote sensing to the search for mineral deposits are presented. The application to the discovery of aggregate limestone and porphyry copper deposits is illustrated. It is shown that the use of satellite and high-altitude remote sensing data through a wide range of the energy spectrum, coupled with electronic processing, offers new prospects in the exploration of lead, zinc, tungsten, molybdenum, uranium, oil, gas, and water resources. T.S.

**A75-10790 #** A satellite view of weather systems over the North American Arctic. N. A. Streten (Alaska, University, Fairbanks, Alaska). *Weather*, vol. 29, Oct. 1974, p. 369-380. 8 refs. Contract No. NOAA-3-35400.

The polar orbiting NOAA-2 satellite launched in October 1972 carries the Very High Resolution Radiometer (VHRR). The VHRR scans simultaneously in both the visible and the thermal infrared with a resolution at nadir of one kilometer. The VHRR imagery possesses considerable potential in polar meteorology. A number of pictures showing VHRR imagery are presented. The value of complementary visible and infrared imagery at high resolution in a synoptic analysis in the arctic is illustrated with the aid of a few examples. G.R.

**A75-11443 #** Optical-acoustic detection of low concentrations of hydrogen fluoride, nitrous oxide, and carbon dioxide in gases using pulsed hydrogen-fluoride laser radiation (Optiko-akusticheskoe detektirovaniye malykh kontsentratsii molekul fluoristogo vodoroda, okisi azota i dvoukisi ugleroda v gazakh izlucheniem impul'snogo lazera na fluoristom vodorode). A. S. Gomeniuk, V. P. Zharov, D. D. Ogurok, E. A. Riabov, O. A. Tumanov, and V. O. Shaidurov (Akademiya Nauk SSSR, Institut Spektroskopii, Moscow, USSR). *Kvantovaya Elektronika* (Moscow), vol. 1, Aug. 1974, p. 1805-1811. 11 refs. In Russian.

**A75-11720** The 1973 program of measurement of the minor constituents of the stratosphere using the Concorde 001 (Campagne 1973 de mesures des constituants mineurs dans la stratosphère par Concorde 001). M. Ackerman (Institut d'Aéronomie

Spatiale de Belgique, Brussels, Belgium) and R. Joatton (Société Nationale Industrielle Aérospatiale, Paris, France). *L'Aéronautique et l'Astronautique*, no. 47, 1974, p. 15-22. 10 refs. In French.

Review of the genesis, definition, and performance of the 1973 program of measurement of the rare (NO, NO<sub>2</sub>, SO<sub>2</sub>, CH<sub>4</sub>, HCHO, and HNO<sub>3</sub>) constituents of the stratosphere using infrared spectroscopy on 12 specially planned flights of the Concorde 001. The obtained data have made possible the validation of some models predicting the condition of the stratosphere after a few decades of contamination by pollutants. M.V.E.

**A75-11730** More information and less data from space. H. M. Gurk (RCA, Astro-Electronics Div., Princeton, N.J.). *RCA Engineer*, vol. 20, Aug.-Sept. 1974, p. 38-41. 9 refs.

Higher resolution, more spectral bands, and greater frequency of coverage are desires of most users of remote sensor data. However, considering only current programs like the Earth Resources Technology Satellite, environmental satellites, and aircraft-based sensor systems, the volume of data offers a substantial processing problem to NASA. Potential data users are experiencing similar difficulties. Increased facilities and manpower may not be the best solution. Current analyses are revealing how much of the data is redundant. If the important information were extracted from the large volume of data, it would be possible simultaneously to reduce the volume and permit desired improvements in resolution or frequency of observation. Techniques such as data compression, statistical sampling, and mixed-highs multispectral sensing can reduce the data greatly. Data volume reduction, problems of utilization, and usefulness are discussed for each technique. (Author)

**A75-11732** A microwave correlation spectrometer for air pollution monitoring. A. K. Ghosh and H. J. Moody (RCA, Ltd., Montreal, Canada). *RCA Engineer*, vol. 20, Aug.-Sept. 1974, p. 46-48. 11 refs.

The new instrument reported makes use of the adaptation of a correlation technique to microwave spectroscopy. Questions concerning the employment of microwave spectroscopy for pollutant analysis are considered. The principle of correlation spectroscopy is based on the fact that the cross-correlation between spectra of different gases is very small. In the new instrument the basic principles are somewhat modified to ensure better stability and sensitivity. G.R.

**A75-12031 \* #** The progeny of Skylab - The pioneering phase of our expansion into space. H. H. Schmitt (NASA, Office of Energy Programs, Washington, D.C.). *American Institute of Aeronautics and Astronautics and American Geophysical Union, Conference on Scientific Experiments of Skylab, Huntsville, Ala., Oct. 30-Nov. 1, 1974, AIAA Paper 74-1216*. 4 p.

The opportunities provided by such near-earth space resources as the continuous view of the earth, sun, and stars, the presence of ultrahigh vacuum, and the absence of gravitational stress are briefly reviewed, along with the significance of manned observation and experimentation in near-earth space. The stimulation triggered in young minds by a week or summer in space, as the Apollo and Skylab experiences show, simply defies the imagination. The plea is made not to miss these opportunities. M.V.E.

**A75-12035 \* #** Skylab altimeter applications and scientific results. J. T. McGoogan, C. D. Leitao (NASA, Wallops Flight Center, Wallops Island, Va.), W. T. Wells (Wolf Research and Development Corp., Riverdale, Md.), L. S. Miller, and G. S. Brown (Applied Science Associates, Inc., Apex, N.C.). *American Institute of Aeronautics and Astronautics and American Geophysical Union, Conference on Scientific Experiments of Skylab, Huntsville, Ala., Oct. 30-Nov. 1, 1974, AIAA Paper 74-1221*. 14 p. 7 refs.



Analysis of the Skylab S-193 Altimeter Experiment data has produced many significant results. The purpose of this paper is to present some of these results which illustrate the programmatic altimeter technology gained and show the scientific potential of altimetry for various applications, including correlation with existing topographic features, geoids and physical models. It will be shown that there exists a very strong correlation between subsurface topography in the broad ocean area and the shape of the ocean surface as determined from the altimeter. Modeled scattering waveforms will be correlated with Skylab Altimeter waveforms. The agreement of a variety of existing geoid models with the altimeter data will be shown. In addition the calibration, accuracy and stability of the S-193 altimeter instrumentation will be discussed. (Author)

**A75-12036 \* #** Automatic land use classification using Skylab S-192 multispectral data. L. Kirvida and M. Cheung (Honeywell Systems and Research Center, Minneapolis, Minn.). *American Institute of Aeronautics and Astronautics and American Geophysical Union, Conference on Scientific Experiments of Skylab, Huntsville, Ala., Oct. 30-Nov. 1, 1974, AIAA Paper 74-1224.* 7 p. Contract No. NAS9-13386.

Investigation of the accuracy attainable in automatic land use classification using 13 bands of multispectral data from the Skylab S-192 scanner. Classification to levels containing seven urban classes, five agricultural, and three water classes is shown to be achievable. With 17 classes, a classification accuracy of 72% was obtained. A wide spectral range, including the thermal band, appears to be most useful for distinguishing urban classes. Agricultural and water classes can be separated using spectral bands covering the visible to far IR.

M.V.E.

**A75-12109 \*** Very high resolution radiometer. A. I. Aronson (RCA, Astro-Electronics Div., Princeton, N.J.). *RCA Engineer*, vol. 20, June-July 1974, p. 20-25. 6 refs. Contract No. NAS5-10306.

A primary sensor used in environmental and earth-resource observation, the Very High Resolution Radiometer (VHRR) was designed for use on the ITOS D series spacecraft. The VHRR provides a 0.47 mile resolution made possible with a mercury-cadmium-telluride detector cooled to approximately 105 K by a passive radiator cooler. The components of this system are described. The optical subsystem of the VHRR consists of a scanning mirror, a Dall-Kirkham telescope, a dichroic beam splitter, relay lenses, spectral filters, and an IR detector. Signal electronics amplify and condition the signals from the infrared and visible light detector. Sync generator electronics provides the necessary time signals. Scan-drive electronics is used for commutation of the motor winding, velocity, and phase control. A table lists the performance parameters of the VHRR.

T.S.

**A75-12317 #** Detection of synchronous changes in fluxes of energetic electrons and gamma-quanta during a magnetic disturbance (Obnaruzhenie sinkhronnykh izmenenii potokov energichnykh elektronov i gamma-kvantov vo vremia magnitnogo vozmushcheniia). S. A. Voronov, A. M. Gal'per, V. G. Kirillov-Ugrumov, A. V. Kurochkin, N. G. Leikov, B. I. Luchkov, A. I. Fesenko, and Iu. T. Iurkin. (*Vsesoiuznaia Konferentsiia po Fizike Kosmicheskikh Luchei, Kharkov, Ukrainian SSR, Sept. 25-28, 1973; Akademiia Nauk SSSR, Izvestiia, Serii Fizicheskaiia*, vol. 38, Sept. 1974, p. 1966-1969. 5 refs. In Russian.

**A75-12874** Special color analysis techniques. P. G. Smith (USAF, Rome Air Development Center, Griffiss AFB, N.Y.), K. R. Piech, and J. E. Walker (Calspan Corp., Buffalo, N.Y.). *Photogrammetric Engineering*, vol. 40, Nov. 1974, p. 1315-1319, 1321, 1322. 11 refs.

Special color analysis techniques offer an approach to improve the U.S. Air Force's capability for extracting additional information

from reconnaissance sensor records through the use of the photometric properties of the sensor records. A program concerned with the development of such techniques has provided a console for the performance of photometric analysis. Nonmilitary applications of the new techniques are related to crop analysis, mapping of flooding conditions, monitoring of water quality, and analyses of ERTS and Skylab imagery.

G.R.

**A75-12947 #** Automated remote measurement system in agricultural meteorology (Avtomatizirovannaia sistema distantionnykh izmerenii v agrometeorologii). V. A. Kovalenko, A. D. Kleshchenko, and O. V. Virchenko (Glavnoe Upravlenie Gidrometeorologicheskoi Sluzhby SSSR, Institut Eksperimental'noi Meteorologii, Obninsk, USSR). *Meteorologiya i Gidrologiya*, Sept. 1974, p. 93-97. 15 refs. In Russian.

An automated system for the acquisition and processing of aerophotometry data on young agricultural crops is examined. The system's principles of operation are outlined, and its block diagram and principal elements are discussed.

V.P.

**A75-12980 \* #** Satellite techniques for the study of secular variations in position. J. W. Siry (NASA, Washington, D.C.). In: Symposium on Earth's Gravitational Field and Secular Variations in Position, Sydney, Australia, November 26-30, 1973, Proceedings. Kensington, Australia, University of New South Wales, 1974, p. 360-379. 30 refs.

Some crustal motions which are precursory to earthquakes are discussed and a system for monitoring such motions is proposed. Studies have shown that the scale of a dilatant region is an indicator both of the magnitude of subsequent earthquake and of the time interval between the earthquake and the precursory phenomena. Monitoring may be accomplished by the use of corner reflectors at sites situated in an array over a given region, such as California, for example, the sites being tracked by means of a laser system operating in the Geopulse satellite.

P.T.H.

**A75-12985 \* #** Earth parameters from global satellite triangulation and trilateration. I. I. Mueller (Ohio State University, Columbus, Ohio). In: Symposium on Earth's Gravitational Field and Secular Variations in Position, Sydney, Australia, November 26-30, 1973, Proceedings. Kensington, Australia, University of New South Wales, 1974, p. 529-552; Discussion, p. 553. 14 refs. Grant No. NGL-36-008-093.

Results obtained from 159-station global satellite triangulation and trilateration (including Baker-Nunn, BC-4, PC-1000 camera observations, SECOR, C-Band radar and EDM distance measurements) indicate differences in the semidiameter and orientation of the earth compared to results obtained from dynamic satellite solutions. Geoidal undulations obtained can be made consistent with dynamically determined ones at the expense of slight changes in the currently accepted parameters defining the gravity field of the level ellipsoid.

(Author)

**A75-13148** Trace gas analysis of power plant plumes via aircraft measurement - O<sub>3</sub>, NO<sub>x</sub>, and SO<sub>2</sub> chemistry. D. D. Davis, G. Smith, and G. Klauber (Maryland, University, College Park, Md.). *Science*, vol. 186, Nov. 22, 1974, p. 733-736. 7 refs. NSF Grant No. GI-36338X.

**A75-13589 \*** Apollo Telescope Mount experiments technology. W. C. Keathley (NASA, Marshall Space Flight Center, Huntsville, Ala.). In: Technology today for tomorrow; Proceedings of the Eleventh Space Congress, Cocoa Beach, Fla., April 17-19, 1974. Volume 2. i Cocoa Canaveral, Fla., Canaveral Council of Technical Societies, 1974, p. 1-1 to 1-45. 10 refs.

The Skylab Apollo Telescope Mount (ATM) experiments, consisting of a white light coronagraph, four ultraviolet instruments,

two X-ray telescopes and two hydrogen-alpha telescopes, observed the sun daily for nine solar rotations. The ATM instruments were individually larger, more complex, and provided better spatial resolution than previous solar satellite instruments. An additional major advantage of the telescope complex was its ability to simultaneously collect multispectral data of specific solar phenomena. To maximize the scientific benefits of the orbiting observatory, a coordinated observing program involving worldwide ground-based observatories was conducted. A description of the Skylab, the ATM, and the ATM experiments is given, and the daily process of flight planning and execution is described. (Author)

**A75-13765 Spectrophotometric observations of earth from 'Soyuz-13'.** A. A. Buznikov, K. Ia. Kondrat'ev, V. V. Lebedev, and V. M. Orlov (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). *International Astronautical Federation, International Astronautical Congress, 25th, Amsterdam, Netherlands, Sept. 30-Oct. 5, 1974, Paper 74-156*. 20 p. 15 refs.

The use of different geometry of measurements from a satellite and of different conditions of solar illumination of the atmosphere and the underlying surface permits the obtaining of the information both of the gaseous and aerosol composition and of the state of different natural formations on the earth's surface. Therefore it is necessary to point out that the results of measurements on Soyuz 13 of solar radiation reflected and scattered by the surface-atmosphere system open up the possibility of a further development of the methods for the solution of inverse problems of atmospheric space optics. F.R.L.

**A75-13868 Investigations of the ionosphere by space techniques.** S. A. Bowhill (Illinois, University, Urbana, Ill.). *Journal of Atmospheric and Terrestrial Physics*, vol. 36, Dec. 1974, p. 2235-2243. 56 refs.

Key developments in ionosphere research from new types of measurement using space vehicles are outlined. The usefulness of radio-propagation techniques in space research is discussed. Ground-based techniques such as incoherent scatter may be used to duplicate measurements made from space vehicles. The remote sensing of atmospheric minor constituents by optical techniques is reviewed. T.S.

**A75-13963 Skylab. II - The three month vigil.** D. Baker. *Spaceflight*, vol. 16, Dec. 1974, p. 456-461.

The Skylab 3 flight is traced chronologically from Day 7 to Day 15. Continuing problems were created by the failure of Control Moment Gyro (CMG) No. 1 on Day 8 and abnormal operation of CMG-2. Extra-vehicular activities (EVA), Kohoutek photography, the Black Brant IV rocket launching, earth resources experiments, medical experiments, and solar flare observations are considered. A.T.S.

**A75-14726 Electronics in meteorological instrumentation.** C. V. Else, D. J. Painting, and K. J. T. Sands (Meteorological Office, Bracknell, Berks., England). *IEE Reviews*, vol. 121, Nov. 1974, p. 1201-1223. 57 refs.

The evolution of electronic circuit applications in meteorological instrumentation is surveyed by discussing methods and equipment used for satellite, atmospheric-vehicle, ground, and sea based measurements. Attention is given to the principles of radio-sondes, high-altitude wind measurement, ozone studies, and determination of such parameters as cloud height, visibility, surface winds, and insolation. T.M.

**A75-14792 Performance of a hologram matrix radar.** K. Iizuka, H. Ogura, J. L. Yen, V. K. Nguyen (Toronto, University, Toronto, Canada), and J. Weedmark (Bell Northern Research, Ltd., Ottawa, Canada). *IEEE, Proceedings*, vol. 62, Dec. 1974, p. 1718, 1719. Research supported by the Department of Energy, Mines, and Resources of Canada.

A novel radar system, which had been designed as a holographic ice surveying system for the mapping of ice profiles, was developed and successfully tested. The principles of operation of the new radar are based on the concept of the hologram matrix. The radar can be considered either as a new application of holography or as a synthetic phased array system. The results of an experimental investigation show that the novel radar can be used for mapping the profile of thin ice. G.R.

**A75-14803 \* Estimation of sea surface temperature from remote sensing in the 11- to 13-micron window region.** C. Prabhakara, V. G. Kunde (NASA, Goddard Space Flight Center, Greenbelt, Md.), and G. Dalu (CNR, Istituto di Fisica dell'Atmosfera, Rome, Italy). *Journal of Geophysical Research*, vol. 79, Nov. 20, 1974, p. 5039-5044. 26 refs.

The Nimbus 3 and 4 Iris spectral data in the 11- to 13-micron water vapor window region are analyzed to determine the sea surface temperature (SST). The high spectral resolution data of Iris are averaged over approximately 1-micron-wide intervals to simulate channels of a radiometer to measure the SST. In the present exploratory study, three such channels in the 775- to 960-per cm (12.9-10.5 micron) region are utilized to measure the SST over cloud-free oceans. However, two of these channels are sufficient in routine SST determination. The differential absorption properties of water vapor in the two channels make it possible to determine the water vapor absorption correction without detailed knowledge of the vertical profiles of temperature and water vapor. The feasibility of determining the SST is demonstrated globally with Nimbus 3 data, where cloud-free areas can be selected with the help of albedo data from the medium-resolution infrared radiometer experiment on board the same satellite. The SST derived from this technique agrees with the measurements made by ships to about 1 C. (Author)

**A75-15434 Hologrammetry - Concepts and applications.** E. M. Mikhail (Purdue University, West Lafayette, Ind.). *Photogrammetric Engineering*, vol. 40, Dec. 1974, p. 1407-1422. 12 refs. Army-sponsored research.

Research in holographic applications to mapping during the past several years has led to the introduction of the term hologrammetry. It is an interdisciplinary field combining holographic techniques for purposes of interpretation, mensuration, mapping, and display. A concise account of Fresnel and focused-image holograms, both transmission and reflection types, includes their characteristics and suitable applications. Mensuration and mapping techniques of holograms and results obtained follow. This includes targeting and digital mapping as well as graphical plotting of contours, cross-sections, etc. The use of direct holograms has been practically limited to small close-range objects. To extend the capability to topographic terrain applications from aerial photography, one must apply the concept of the holographic stereomodel. Both Fresnel and focused-image holographic stereomodels possess related advantages. (Author)

**A75-15953 # Mathematical modeling for the detection of fish by an airborne laser.** D. L. Murphree, C. D. Taylor (Mississippi State University, Mississippi State, Miss.), and R. W. McClendon. *AIAA Journal*, vol. 12, Dec. 1974, p. 1686-1692. 12 refs. Research supported by the National Marine Fisheries Service.

To assess the feasibility of an airborne remote sensing laser system for fish detection, a mathematical model was developed and solved which incorporated the physical interactions involved in the process of laser transmission through the air/sea interface and ocean environment. For a circular laser beam incident normal to the ocean surface, the power density was determined beneath the ocean surface as a function of surface roughness (wind velocity) and depth. Using the principle of electromagnetic reciprocity, the power reflected from submerged targets and detected at the airborne receiver was determined. The results from the developed mathematical model,

using input parameters of presently available equipment and estimates of fish school density and reflectivity, reveal that the power received at an airborne detector from fish reflected incident laser radiation and the signal-to-noise ratio (S/N) are of sufficient magnitude to locate fish schools with an airborne remote sensing laser system. (Author)

**A75-16096 \*** Skylab radar altimeter - Short-wavelength perturbations detected in ocean surface profiles. C. D. Leita and J. T. McGoogan (NASA, Wallops Flight Center, Wallops Island, Va.). *Science*, vol. 186, Dec. 27, 1974, p. 1208, 1209. 7 refs.

Short-wavelength anomalies in sea surface topography, caused by the gravitational effects of major ocean bottom topographic features, have been detected by the radar altimeter aboard Skylab. Some features, such as deep ocean trenches, seamounts, and escarpments, displace the ocean surface by as much as 15 meters over 100-kilometer wavelengths. This experiment demonstrates the potential of satellite altimetry for determining the ocean geoid and for mapping major features of the ocean bottom. (Author)

**A75-16188 #** Images from the NOAA-3 very high resolution radiometer over the North Sea and adjoining countries. P. K. Rao and E. P. McClain (NOAA, National Environmental Satellite Service, Washington, D.C.). *Weather*, vol. 29, Dec. 1974, p. 436-442.

**A75-16191 \*** A radio picture of the earth. W. J. Webster, Jr., T. T. Wilheit, T. C. Chang, P. Gloersen, and T. J. Schmugge (NASA, Goddard Space Flight Center, Atmospheric and Hydrospheric Applications Div., Greenbelt, Md.). *Sky and Telescope*, vol. 49, Jan. 1975, p. 14-16.

A technique called passive microwave remote sensing can be used to obtain a new view of the planet earth by means of radio telescopes carried aboard artificial satellites. An important relationship between the observed radio brightness temperature and the surface conditions provides the basis for the new technique. A radio image is presented of the entire earth on the basis of Nimbus microwave-image data taken January 12-16, 1973. G.R.

**A75-16485 \*** Remote atmospheric sensing with an airborne laser absorption spectrometer. R. T. Menzies and M. T. Chahine (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *Applied Optics*, vol. 13, Dec. 1974, p. 2840-2849. 25 refs. Contract No. NAS7-100.

A laser absorption spectrometer, using an IR laser transmitter and a heterodyne radiometer, can be used from an aircraft or spacecraft to measure altitude profiles of air pollutants and other atmospheric constituents. The technique involves measurement of differential absorption at several wavelengths, using the diffusely reflecting earth's surface to provide a return signal. The pressure broadening of absorption lines allows one to discriminate between high and low altitude absorbers. Application of the technique to measurements of ozone, nitric oxide, and water vapor are presented. CO<sub>2</sub> and CO lasers are considered as transmitters. The discussion includes altitude resolution limitations, atmospheric temperature dependence, and frequency stability requirements of the instrument. (Author)

**A75-17101 \*** International Symposium on Remote Sensing of Environment, 9th, University of Michigan, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volumes 1, 2 & 3. Symposium sponsored by the Environmental Research Institute of Michigan, University of Michigan, NASA, et al. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974. Vol. 1, 808 p.; vol. 2, 797 p.; vol. 3, 684 p. Price of three volumes, \$35.

The present work gathers together numerous papers describing the use of remote sensing technology for mapping, monitoring, and

management of earth resources and man's environment. Studies using various types of sensing equipment are described, including multispectral scanners, radar imagery, spectrometers, lidar, and aerial photography, and both manual and computer-aided data processing techniques are described. Some of the topics covered include: estimation of population density in Tokyo districts from ERTS-1 data, a clustering algorithm for unsupervised crop classification, passive microwave sensing of moist soils, interactive computer processing for land use planning, the use of remote sensing to delineate floodplains, moisture detection from Skylab, scanning thermal plumes, electrically scanning microwave radiometers, oil slick detection by X-band synthetic aperture radar, and the use of space photos for search of oil and gas fields.

Individual items are announced in this issue.

P.T.H.

**A75-17111 \* #** Transference of ERTS-1 spectral signatures in time and space. B. F. Merembeck, F. Y. Borden, and D. N. Applegate (Pennsylvania State University, University Park, Pa.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 153-161. Research supported by the Hatch Funds; Contract No. NAS5-23133.

Some earth resources maps obtained from ERTS-1 multispectral scanning data in 1972-73 were found to contain modulo six banding. A method was found to recalibrate nonconformable data from the sensors in order to eliminate banding in the map output. This investigation led to developing a recalibration method for transferring data signatures from one scene to another scene separated from the first either temporally or spatially. The method was generally successful, although difficulties were encountered in transferring signatures from one season to another for the same location. A.T.S.

**A75-17119 \* #** Signatures of various earth surfaces measured by the Nimbus-5 microwave spectrometer. K. F. Kunzi, R. L. Pettyjohn, D. H. Staelin (MIT, Cambridge, Mass.), and J. W. Waters (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 299-305. 6 refs. Contract No. NAS7-100.

The Nimbus-5 Meteorological Satellite is equipped with a 5-channel microwave spectrometer. The two lowest channels (22.2 and 31.4 GHz) provide information on surface brightness temperature. Distinctive microwave signatures can be observed for snow, land ice, and sea ice in both polar regions. Some information on subsurface temperatures can be gained for desert areas. (Author)

**A75-17124 #** Passive microwave sensing of moist soils. A. E. Basharinov, L. F. Borodin, and A. M. Shutko (Akademiia Nauk SSSR, Moscow, USSR). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 363-367. 6 refs.

Passive microwave observations of moist soils were performed at wavelengths of 0.8 and 3.4 cm from an aircraft. Data obtained are compared with the results of direct measurements of soil moisture content. The dependence of brightness temperature on the value of moisture content is observed, as well as the influence of vegetation cover. (Author)

**A75-17141 \* #** Application of remote sensing to the location of hydrologically active /source/ areas. A. M. Ishaq and D. D. Huff (Wisconsin, University, Madison, Wis.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April

15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 653-666. 21 refs. Grant No. NGL-50-002-127.

Recent hydrologic research has provided theoretical support for a hypothesis generally known as the variable source area concept. However, experimental study of variable source areas has been hampered by lack of suitable methods for identifying and mapping them on a large scale basis. Field studies combined with color infrared photography and direct measurement of soil moisture and other hydrologic variables have shown that it is definitely possible to differentiate high and low soil moisture zones in a watershed. Furthermore, mapping of high moisture zones for the 1839 hectare Lowery Creek, Wisconsin drainage basin has revealed a pattern that is fully consistent with hypotheses concerning source areas. Examination of transmittance curves for high moisture zones indicates that source areas may be delineated on the basis of the ratio of their transmittance at 550 nm to that at 675 nm. (Author)

**A75-17142 \* #** The use of remote sensing and natural indicators to delineate floodplains - Preliminary findings. S. C. Sollers, G. W. Petersen, D. L. Henninger, and F. Y. Borden (Pennsylvania State University, University Park, Pa.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich, April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 667-681. 9 refs. NASA-supported research.

Felisibility studies to delineate floodplains using aerial photography have been conducted by the Army Corps of Engineers. The objective of this project is to establish floodplain boundaries using natural indicators such as vegetation types, soil types, moisture differences, and geologic variations. Using aircraft multispectral data, an automated mapping routine should enable the Corps of Engineers to reduce costly field surveys and improve the accuracy of floodplain delineation in pristine areas. The purpose of this paper is to document the methodology utilized in this investigation while using one of a series of available data sets and test sites and to report preliminary findings. (Author)

**A75-17147 #** On the feasibility of remote monitoring of soil moisture with microwave sensors. R. W. Newton, S. L. Lee, J. W. Rouse, Jr. (Texas A & M University, College Station, Tex.), and J. F. Paris (Lockheed Electronics Co., Inc., Houston, Tex.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 725-738. 16 refs.

Recent airborne measurements of radiometric temperature at monitored sites located near Chickasha, Oklahoma, and Weslaco, Texas show that vegetation cover has the effect of masking the soil moisture dependence of the microwave data. Peake's model is inappropriate for describing emission in the presence of a vegetative cover; therefore, a new model was developed which computes emissivity directly from the material properties of the subsurface media and the transmission coefficients of the surface. This work was used to develop a model for the apparent microwave temperature and radar backscatter coefficient of vegetated terrain to illustrate the effects of vegetation on the sensitivity of these parameters to variations of soil moisture. A ground measurement program was established in order to obtain data to compare the predictions of the models. (Author)

**A75-17148 \* #** Operational use of satellite and high altitude remote sensing for the generation of input data for water demand models. L. R. Tinney, J. E. Estes, K. H. Thaman, and R. R. Thaman (California, University, Santa Barbara, Calif.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 739-757. NASA-supported research.

**A75-17192 #** The interpretation and use of false-colour infra-red and true colour photography of part of Argentina obtained by Skylark earth resources rockets. D. S. H. Drennan, C. J. Bray, J. R. Hardy, C. O. Justice, R. A. G. Savigear, J. R. G. Townshend (Reading University, Reading, England), I. R. Galloway, and E. S. Owen-Jones (Bedford College, London, England). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1475-1496. 16 refs. Ministry of Defense (Procurement Executive) Grants No. AT/2035/015/SP; No. AT/2035/025/ASA.

**A75-17194 #** A preliminary feasibility study on a synthetic aperture radar /SARSAT/ for earth resources surveys. C. Skenderoff, J. P. Guignard (Thomson-CSF, Meudon, Hauts-de-Seine, France), J. R. Coldrick, H. Mooney (British Aircraft Corp., Bristol, England), and J. Noel (Société d'Etudes Techniques et d'Entreprises Générales, le Plessis-Robinson, Hauts-de-Seine, France). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1517-1540. Research supported by the European Space Research Organization.

**A75-17195 \* #** Investigation of microwave hologram techniques for application to earth resources. R. W. Larson, R. W. Bayma, M. B. Evans, J. S. Zelenka, H. W. Doss (Michigan, Environmental Research Institute, Ann Arbor, Mich.), and J. E. Ferris (Michigan, Environmental Research Institute; Michigan, University, Ann Arbor, Mich.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1541-1569. 20 refs. Contract No. NAS1-10810.

An investigation of microwave hologram techniques for application to earth resources was conducted during the period from June 1971 to November 1972. The objective of this investigation has been to verify the feasibility of an orbital microwave holographic radar experiment. The primary advantage of microwave hologram radar (MHR) over the side-looking airborne radar (SLAR) is that of aspect or viewing angle; the MHR has a viewing angle identical with that of photography and IR systems. The combination of these systems can thus extend the multispectral analysis concept to span optical through microwave wavelengths. Another advantage is the capacity of the MHR system to generate range contours by operating in a two-frequency mode. It should be clear that along-track resolution of an MHR can be comparable with SLAR systems, but cross-track resolution will be approximately an order of magnitude coarser than the range resolution achievable with an arbitrary SLAR system. An advantage of the MHR over the SLAR is that less average transmitter power is required. This reduction in power results from the much larger receiving apertures associated with MHR systems. (Author)

**A75-17197 #** Emissivities and forward scattering of natural and man-made material at three millimeter wavelength. E. Schanda and R. Hofer (Bern, Universität, Berne, Switzerland). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1585-1592.

For the interpretation of the thermal images produced by a high-resolution 3-mm scanning radiometer, an investigation of the emissivities of natural and man-made materials has been performed. In order to exclude the atmospheric contributions to the measured radiation and to study the angular dispersion of a reflected wave due to surface structuring, the forward scatter properties were mainly investigated. In general, it may be stated that the emissivities of all

materials are closer to unity or equal to those at 3-cm wavelength. The emissivity of water varies from roughly 0.7 to 0.6 for a temperature change from a few degrees centigrade up to about 40 C. An oil film of 0.15 mm increases the emissivity by 0.05. (Author)

**A75-17206 #** Development of an experimental airborne laser remote sensing system for the detection and classification of oil spills. J. F. Fantasia and H. C. Ingrao (U.S. Department of Transportation, Transportation Systems Center, Cambridge, Mass.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1711-1745. 12 refs. Research supported by the U.S. Coast Guard and U.S. Navy.

Results of a study and measurements program to determine the feasibility of using laser-excited oil fluorescence as a means of detecting, classifying, and quantifying oil spills in the marine environment. The study consisted of an analysis of the fluorescence properties of oils and oil slicks on the sea surface, and a theoretical analysis of the remote fluorometry of oil spills. Laboratory measurements were made of 29 crude and refined oils commonly transported in the marine environment. These measurements included API gravity, fluorescence and reflectance spectra, fluorescence coefficient, and fluorescence lifetimes. Similar measurements were made with a laboratory model of an N2 laser oil spill remote sensor. Results of these measurements clearly showed that, under certain conditions, oil spill detection and classification can be made in the ocean environment. Furthermore, remote sensing of oil spills using laser-excited oil fluorescence was found to be technically feasible. (Author)

**A75-17208 #** Multi-frequency radiometric measurements of foam and a mono-molecular slick. B. Au, J. Kenney, L. U. Martin (U.S. Navy, Naval Research Laboratory, Washington, D.C.), and D. Ross (NOAA, Miami, Fla.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1763-1773.

Microwave radiometric measurements have been made of both a surf-zone and an ocean region where small-scale roughness was suppressed by an artificial monomolecular slick. The foam measurements show near identical foam temperatures at 8.35 and 14.5 GHz, but large variations at 1.4 GHz. The resultant maximum foam emissivities at nadir range from 0.57 at 1.4 GHz to 0.84 at 14.5 GHz. The presence of the monomolecular slick on the ocean surface had the same effect as a decrease in surface roughness. For horizontal polarization, the emission decreased below that of the surrounding ocean for all viewing angles. At vertical polarization, the emission decreased below and increased above a viewing angle of approximately 60 deg. (Author)

**A75-17209 #** Oil slick detection by X-band synthetic aperture radar. J. R. Kotlarski and H. R. Anderson (Hughes Aircraft Co., Culver City, Calif.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1775-1790.

**A75-17210 #** The application of spectrometric and polarization techniques for remote sensing of oil on sea water. K. Ia. Kondrat'ev, A. A. Buznikov, D. V. Pozdiakov, G. A. Ivanian, G. A. Lakhtanov, V. M. Orlov, and S. M. Mikhailova (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1793-1802. 18 refs.

**A75-17212 #** An orbiting visible/infrared spectrometer for terrestrial, atmospheric and oceanographic applications. G. R. Pruitt (Block Engineering, Inc., Cambridge, Mass.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1847-1855.

This paper describes the S191 spectrometer developed for use on NASA's Skylab. Design and key features of the instrument are discussed. Performance characteristics, as they relate to earth's resources measurements requirements and capabilities, are presented. Orbital data from the first manned Skylab mission are discussed. Conclusions and recommendations for future usage of this instrument are made. (Author)

**A75-17213 #** A motion-compensated spatial scanner. K. S. Gordon and J. R. Miller (York University, Toronto, Canada). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1857-1863. 5 refs. Research supported by the National Research Council of Canada.

A high resolution multispectral scanner has been built and tested. An interference filter photometer is employed and the way in which this instrument complicates the design of a line scanner is discussed. Preliminary flight test results are presented and plans for future high resolution water studies of phytoplankton pigment concentrations are described. (Author)

**A75-17214 #** The remote Raman spectrometer is a viable instrument for remote sensing of the environment. S. M. Klainer, W. Arden, and T. Hirschfeld (Block Engineering, Inc., Cambridge, Mass.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1865-1876.

The major components of the remote Raman spectrometer system, using a pulsed laser as the monochromatic source, are illustrated and discussed. The laser beam illuminates the sample, scattering being caused by all of the constituents. This is observed through a telescope that is through-put matched to a spectral sorter. The Raman lines are sorted into distinct frequencies. The output of the sorter is detected by photomultiplier tubes, is processed, and is displayed on a chart recorder. Use of a pulsed laser and time gating permits measurement of the distance between the scattering molecules and the light source and collector. V.P.

**A75-17217 \* #** Multi-aspect techniques in remote sensing. W. A. Malila (Michigan, Environmental Research Institute, Ann Arbor, Mich.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1905-1918. 12 refs. Contract No. NAS9-9784.

Multi-aspect techniques, which use multispectral scanner information collected from two or more different view angles for each spatial element, are discussed. Empirical recognition results obtained with various combinations of information channels are presented. Theoretical calculations of multi-aspect reflectances of corn fields also are analyzed and compared with empirical data. Also presented is a brief comparison between recognition processing and scene attribute estimation techniques for extracting information from multispectral scanner data. One method for improving information extraction by employing a post-recognition attribute estimation procedure is suggested. (Author)

**A75-17221 #** Prediction of the Fraunhofer line detectivity of luminescent materials. R. D. Watson, T. D. Hessin, R. C. Bigelow (U.S. Geological Survey, Denver, Colo.), and W. R. Hemphill (U.S. Geological Survey, Reston, Va.). In: International Symposium on

Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1959-1980. 11 refs.

A program is described in which the luminescence of materials at six Fraunhofer lines was quantified. Measurements were made with a laboratory fluorescent spectrometer on selected materials, including crude and refined oils, crude-oil films, oil shales, phosphate, effluents, and in-vivo chlorophyll of geochemically stressed and nonstressed vegetation. Results indicate that the luminescence of the petroleum and phosphate effluent samples studied is equivalent to, or exceeds by several orders of magnitude the luminescence of Rhodamine WT dye at the minimum concentration detectable with the Fraunhofer line discriminator (FLD). Geochemically stressed and nonstressed vegetation luminesce at the 656.3-nm Fraunhofer line at intensities that vary both diurnally and seasonally from levels just within the sensitivity limits of an FLD to one order of magnitude above this level. An improved FLD has been built and preliminary tests were performed on some of the materials noted above. This instrument was found to respond to Rhodamine WT dye concentrations as small as microgram/l. (Author)

**A75-17223 #** Remote sensing techniques applied to the study of Italian volcanic areas - The results of the repetition of the airborne I.R. survey compared to the previous data. R. Cassinis, C. M. Marini (Milano, Università, Milan, Italy), and A. M. Tonelli (CNR, Laboratorio per la Geofisica della Litosfera, Milan, Italy). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1989-2004. 6 refs.

**A75-17230 \* #** The remote-sensing program of the Geological Survey of Alabama. J. A. Drahovzal, J. L. G. Emplainscourt, and C. C. Wielchowsky (Alabama, University, University, Ala.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 2059-2072. 19 refs. U.S. Geological Survey Contract No. 14-08-001-13377; Contract No. NAS5-21876.

Some areas of remote-sensing research in Alabama are reviewed, showing how remote sensing technology can provide data that cannot be obtained by other methods. Applications of this technology to structural and stratigraphic research and to the search for water, mineral, and energy sources are discussed, and some results of these applications are illustrated. V.P.

**A75-17231 \* #** Resource analysis applications in Michigan. S. W. Schar, W. R. Enslin (Michigan State University, East Lansing, Mich.), I. J. Sattinger (Michigan, Environmental Research Institute, Ann Arbor, Mich.), J. G. Robinson, K. R. Hosford (Michigan Department of Natural Resources, Lansing, Mich.), R. S. Fellows (Soil Conservation Service, Lansing, Mich.), and J. H. Raad (U.S. Department of State Highways and Transportation, Bureau of Transportation Planning, Lansing, Mich.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 2073-2081. Research supported by the Environmental Research Institute of Michigan and NASA.

During the past two years, available NASA imagery has been applied to a broad spectrum of problems of concern to Michigan-based agencies. These demonstrations include the testing of remote sensing for the purposes of (1) highway corridor planning and impact assessments, (2) game management-area information bases, (3) multi-agency river basin planning, (4) timber resource management information systems, (5) agricultural land reservation policies, and (6) shoreline flooding damage assessment. In addition, cost accounting procedures have been developed for evaluating the relative costs of utilizing remote sensing in land cover and land use analysis data collection procedures. (Author)

**A75-17232 #** Applications of remote sensing by the state of Nebraska. M. Carlson, R. Petersen, R. Hoffman, J. Drew, D. Edwards, G. Hergenrader, N. Rosenberg, L. Sheffield (Nebraska, University, Lincoln, Neb.), M. Ball (Nebraska State Department of Water Resources, Lincoln, Neb.), and J. Barr (Nebraska State Office of Planning and Programming, Lincoln, Neb.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3.

Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 2083-2086.

Some past, present, and future remote sensing projects undertaken by the State of Nebraska are briefly described. A photomosaic and Level I land use map of Nebraska, both derived from ERTS-1 imagery, have been published at a scale of 1:1,000,000. In two counties, over 7000 fields were outlined from ERTS-1 imagery and classified as alfalfa, wheat, wetland pasture, range and pasture, nonirrigated row crops, and irrigated corn. An evapotranspiration project is determining the feasibility of using thermal imagery to obtain temperatures for use in evapotranspiration models. The possibility of measuring selected aspects of water quality in Nebraska reservoirs by remote sensing is also being investigated. The concentrations of chlorophyll and the degree of inorganic turbidity will be quantified by remote sensing. P.T.H.

**A75-18071** The Skylab S-190B Earth Terrain Camera. J. D. McLaurin (U.S. Geological Survey, National Center, Reston, Va.). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1974, p. 268-278.

The Skylab missions, completed in February 1974, included a wide variety of experiments in the fields of engineering, medicine, astronomy, and earth resources. The sensor of particular interest to the mapping and earth resources community was the S-190B Earth Terrain Camera (ETC). The ETC is a 460-mm focal-length frame camera with a 115- by 115-mm format. It includes an image motion compensation system of an f/4 color-corrected lens. The predicted low contrast (1.6:1) ground resolution for color photographs is 14 m/1p or 70 1p/mm; the expected resolution for black-and-white photographs is 10 m/1p or 100 1p/mm. Considerable cloud-free imagery using color, color-infrared, and black-and-white films was obtained during the three Skylab missions. A map showing the ETC coverage is included in the paper. Preliminary analyses indicate that the photographs have the necessary resolution and geometric fidelity for preparing photomaps at 1:100,000 scale and possibly larger scales. Other investigators are evaluating the photographs for geologic, mineral resources, and land-use mapping, and for archeological, water resources, and recreational studies. (Author)

**A75-18072** Early results from the experimental Automated Image Data Extraction System. L. P. Murphy (U.S. Army, Geographic Sciences Laboratory, Fort Belvoir, Va.). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1974, p. 300-321.

The USAETL experimental Automated Image Data Extraction System (AIDES-I) was fabricated to enable experimentation leading to the development of a man/machine interactive, multiple-image processing system to facilitate the extraction of terrain information (e.g. vegetation, soils, etc.) from a variety of imagery such as conventional aerial photographs, multiband images, and radar images. Examples of early data extraction experiments are shown and described which used multiband input images to spectrally separate features at analog processing rates. (Author)

## 08 INSTRUMENTATION AND SENSORS

**A75-18074** Automatic pattern recognition and mapping utilizing thermal infrared imagery. S.-Y. Hsu (New York, State University, Binghamton, N.Y.). In: American Society of Photogrammetry, Fall Meeting, Washington, D.C., September 10-13, 1974, Proceedings. Falls Church, Va., American Society of Photogrammetry, 1974, p. 332-342.

**A75-18693** Earth sciences in the age of the satellite. J. Pouquet (Aix-Marseille, Université, Aix-en-Provence, Bouches-du-Rhône, France). (Translation of Les sciences de la terre à l'heure des satellites /Télétection/, Paris, Presses Universitaires de France, 1971.) Dordrecht, D. Reidel Publishing Co., 1974. 178 p. 146 refs. \$23.40.

Following a brief review of the beginnings of remote sensing, the basic principles are outlined. These make use of various bands of the spectrum, including the visible and near infrared range, the invisible range, and emitted and reflected radiations. It is considered that remote sensing techniques will occupy first place in earth science studies. Types of satellites are described. The problem of the real hour is discussed, followed by description of satellite instrumentation. Satellites intended for earth science studies are NERO, SCMR and ESMR, RBV, and MSS (ERTS A and B). Treatment of information received from satellites is studied, and comparative evaluation is made of aircraft vs satellites. The use of manned satellites, and general principles of interpretation are considered. Some geopedological and nongeopedological examples are discussed, as well as prospects for the future. F.R.L.

**A75-19265** Conference on Environmental Sensors and Applications, London, England, November 18, 19, 1974, Proceedings. Conference sponsored by the Institution of Electronic and Radio Engineers. London, Institution of Electronic and Radio Engineers (IERE Conference Proceedings, No. 29), 1974. 239 p. \$20.75.

Recent advances in air pollution monitoring equipment and techniques, meteorological sensors, and remote sensing technology are reported. Some of the topics covered include: the point visibility meter - a forward scatter instrument for the measurement of aerosol extinction coefficient, a continuously recording aerosol photometer for monitoring respirable airborne dust, instrumentation for boundary layer research in meteorology, a new generation of sensors for automatic weather stations, measurement of rainfall and microwave attenuation by radar, the role of lidar in environmental sensing, and a submersible water quality station.

P.T.H.

**A75-19266** The point visibility meter - A forward scatter instrument for the measurement of aerosol extinction coefficient. J. V. Winstanley (Plessey Radar, Ltd., Cowes, Isle of Wight, England). In: Conference on Environmental Sensors and Applications, London, England, November 18, 19, 1974, Proceedings. London, Institution of Electronic and Radio Engineers, 1974, p. 19-31. 14 refs.

**A75-19274** The role of lidar in environmental sensing. J. V. Winstanley, M. J. Adams (Plessey Radar, Ltd., Cowes, Isle of Wight, England), and A. Whiteley (Plessey Radar, Ltd., South Leigh, Hants., England). In: Conference on Environmental Sensors and Applications, London, England, November 18, 19, 1974, Proceedings. London, Institution of Electronic and Radio Engineers, 1974, p. 163-173 (3 ff.). 29 refs.

The basic lidar concept is explained with reference to a general form of the lidar equation. Six different extensions of the lidar technique are discussed, and their relative merits are reviewed. Two practical lidar systems are described in some detail - a laser ceilometer and a meteorological lidar for measurement of slant visual range at airfields under conditions of poor visibility. Results obtained with these instruments are presented, and their respective degrees of accuracy are determined. (Author)

**A75-19547** Measurements of the extraterrestrial solar radiant flux from 2981 to 4000 Å and its transmission through the earth's atmosphere as it is affected by dust and ozone. J. J. DeLuise (National Center for Atmospheric Research, Boulder, Colo.). *Journal of Geophysical Research*, vol. 80, Jan. 20, 1975, p. 345-354. 25 refs.

**N75-10532\*#** National Oceanic and Atmospheric Administration, Rockville, Md.

**SKYLAB A PROPOSAL AEROTRIANGULATION WITH VERY SMALL SCALE PHOTOGRAPHY** Quarterly Report, 15 Jul. - 15 Oct. 1974

Morton Keller, Principal Investigator 15 Oct. 1974 1 p EREP

(NASA Order T-4110-B)

(E74-10804; NASA-CR-140498) Avail: NTIS HC \$3.25 CSCL 08B

**N75-10564\*#** Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.

**THE APPLICATION OF REMOTE SENSING TECHNIQUES: TECHNICAL AND METHODOLOGICAL ISSUES**

Fabian C. Polcyn and Thomas W. Wagner Oct. 1974 72 p refs Supported in part by NASA

(Grant NSF GI-34809X1)

(NASA-CR-140674; ERIM-193500-5-X) Avail: NTIS HC \$4.25 CSCL 14B

Capabilities and limitations of modern imaging electromagnetic sensor systems are outlined, and the products of such systems are compared with those of the traditional aerial photographic system. Focus is given to the interface between the rapidly developing remote sensing technology and the information needs of operational agencies, and communication gaps are shown to retard early adoption of the technology by these agencies. An assessment is made of the current status of imaging remote sensors and their potential for the future. Public sources of remote sensor data and several cost comparisons are included. Author

**N75-10573#** Physics Lab. RVO-TNO, The Hague (Netherlands). **PATTERN RECOGNITION RELEVANT TO RECONNAISSANCE AND REMOTE SENSING**

W. J. P. A. Verbeek Aug. 1974 48 p refs

(PhL-1974-23; TDCK-65200) Avail: NTIS

An introduction to the nature of problem statements and solution techniques, especially concerning problems in automated aerial reconnaissance and remote sensing is presented. Stimulation of the awareness that classification and decision making involve more than intuition and that the literature offers an abundance of ready solutions in this field is proposed. ESRO

**N75-10964\*#** Scientific Translation Service, Santa Barbara, Calif. **THE EARTH IN THE LENS OF SALYUT-3**

V. Ivanov Washington NASA Nov. 1974 13 p Transl. into ENGLISH from Aviat. Kosmonavt. (Moscow), no. 9, Sep. 1974 p 38-40

(Contract NASw-2483)

(NASA-TT-F-16028) Avail: NTIS HC \$3.25 CSCL 22C

Experiments performed by the cosmonauts on Salyut-3 and Soyuz-14 are described. The geological-morphological objects on the earth, as well as atmospheric formations and phenomena, were studied. It is concluded that this work represents one of the first steps in the conquest of space. Author

**N75-11310\*#** West Virginia Univ., Morgantown. Dept. of Electrical Engineering.

**APPLICATION AND SENSITIVITY INVESTIGATION OF FOURIER TRANSFORMS FOR MICROWAVE RADIOMETRIC INVERSIONS**

John J. Holmes and Constantine A. Balanis 15 Nov. 1974  
99 p refs

(Grant NGR-49-001-056)

(NASA-CR-140754) Avail: NTIS HC \$4.75 CSCL 14B

Existing microwave radiometer technology now provides a suitable method for remote determination of the ocean surface's absolute brightness temperature. To extract the brightness temperature of the water from the antenna temperature equation, an unstable Fredholm integral equation of the first kind was solved. Fast Fourier Transform techniques were used to invert the integral after it is placed into a cross-correlation form. Application and verification of the methods to a two-dimensional modeling of a laboratory wave tank system were included. The instability of the Fredholm equation was then demonstrated and a restoration procedure was included which smooths the resulting oscillations. With the recent availability and advances of Fast Fourier Transform techniques, the method presented becomes very attractive in the evaluation of large quantities of data. Actual radiometric measurements of sea water are inverted using the restoration method, incorporating the advantages of the Fast Fourier Transform algorithm for computations. Author

**N75-11311#** California Univ., Livermore. Lawrence Livermore Lab.

**FEASIBILITY STUDY OF A GUNN-DIODE MICROWAVE CAVITY SPECTROMETER AS A FORMALDEHYDE MONITOR Final Report**

L. W. Hrubesh Feb. 1974 100 p refs

(Contract W-7405-eng-48)

(UCID-16488) Avail: NTIS HC \$4.75

A prototype of a fixed frequency microwave spectrometer to detect a pure rotational absorption transition of the H<sub>2</sub>(1) C12O16 molecule is described. The instrument was laboratory tested for use as a continuous monitor of formaldehyde in air. Design considerations, principles of operation, and calibration procedures are discussed. F.O.S.

**N75-11432\* Scientific Translation Service, Santa Barbara, Calif. GEOGRAPHIC CORRELATION OF TELEVISION PICTURES OBTAINED FROM WEATHER SATELLITES**

A. V. Bushuyev *In its Space Iconics* (NASA-TT-F-798) Sep. 1974 p 143-145 refs Transl. into ENGLISH of the publ. "Kosmicheskaya Ikonika" Moscow, Nauka Press, 1973 p 123-124

CSCL 08B

The geographical control of satellite pictures, using the terminology of aerial photography, can be treated as the problem of analysis of a single picture with the objective of obtaining a ground contour map. Studies have shown the possibility and capability of the method of composing photographic maps from transformed television pictures. Optico-mechanical transformation solves the problem of geographical correlation for operational purposes. However, this technique does not compensate for electronic distortion, and accounts for earth sphericity only approximately. However, for certain purposes (studying ice drift), the maximum possible accuracy is required. Analytic geographical correlation methods using digital computers should be considered promising. Author

**N75-11433\* Scientific Translation Service, Santa Barbara, Calif. GEOGRAPHICAL CORRELATION OF TV AND IR IMAGES OBTAINED FROM WEATHER SATELLITES**

Ya. L. Ziman, B. N. Nepoklonov, and B. N. Rodionov *In its Space Iconics* (NASA-TT-F-798) Sep. 1974 p 146-155 refs Transl. into ENGLISH of the publ. "Kosmicheskaya Ikonika" Moscow, Nauka Press, 1973 p 126-133

CSCL 08B

The requirements on the accuracy of geographical correlation of TV and IR cloud cover images are determined by the objective of the analysis of the weather information contained in these images. In the operational analysis case, the correlation accuracy need not be high. Errors of several tens of kilometers in determining the location of the cloud formation contours are considered acceptable in this case. Such correlation must be

provided in real image reception time. Scientific studies require accurate correlation of the cloud formation contours. The errors in determining their position should be commensurate with the imaging system resolution. The geometric aspects of developing methods and equipment for geographical correlation of television and infrared images of cloud cover taken from Meteor satellites are discussed. Author

**N75-11434\* Scientific Translation Service, Santa Barbara, Calif. SYSTEM FOR ELECTRONIC TRANSFORMATION AND GEOGRAPHIC CORRELATION OF SATELLITE TELEVISION INFORMATION**

V. P. Dubenskiy, B. L. Nemkovskiy, and B. N. Rodionov *In its Space Iconics* (NASA-TT-F-798) Sep. 1974 p 155-164 refs Transl. into ENGLISH of the publ. "Kosmicheskaya Ikonika" Moscow, Nauka Press, 1973 p 132-140

CSCL 14E

An electronic transformation and correlation system has been developed for the Meteor space weather system which provides transformation and scaling of the original picture, accounts for satellite flight altitude and inclinations of the optical axes of the transmitting devices, and simultaneously superposes the geographical coordinate grid on the transformed picture. Author

**N75-11435\* Scientific Translation Service, Santa Barbara, Calif. GEOGRAPHICAL CORRELATION OF EARTH CLOUD COVER PICTURES OBTAINED FROM UNORIENTED SATELLITES**

V. I. Solovyev *In its Space Iconics* (NASA-TT-F-798) Sep. 1974 p 165-173 refs Transl. into ENGLISH of the publ. "Kosmicheskaya Ikonika" Moscow, Nauka Press, 1973 p 141-146

CSCL 04B

Mathematical models have been developed for the determination of the geographic coordinates of cloud photographs taken from earth satellites. The proposed methods were realized on a Minsk-22 computer, and were used to process the earth cloud pictures obtained from the communications satellite Molniya 1 and the automatic stations Zond 5 and 7. Experience using these methods showed that the accuracy of orientation angular element determination is on the order of 1 deg. Author

**N75-11447\*#** Rice Univ., Houston, Tex. Inst. for Computer Services and Applications.

**AN ANALYSIS OF APPLICATIONS DEVELOPMENT SYSTEMS FOR REMOTELY SENSED, MULTISPECTRAL DATA FOR THE EARTH OBSERVATIONS DIVISION OF THE NASA LYNDON B. JOHNSON SPACE CENTER**

D. L. VanRooy, R. M. Smith, and M. S. Lynn Feb. 1974 127 p

(Contract NAS9-12776)

(NASA-CR-140345; Rept-275-025-018) Avail: NTIS HC \$5.75 CSCL 05B

An application development system (ADS) is examined for remotely sensed, multispectral data at the Earth Observations Division (EOD) at Johnson Space Center. Design goals are detailed, along with design objectives that an ideal system should contain. The design objectives were arranged according to the priorities of EOD's program objectives. Four systems available to EOD were then measured against the ideal ADS as defined by the design objectives and their associated priorities. This was accomplished by rating each of the systems on each of the design objectives. Utilizing the established priorities, it was determined how each system stood up as an ADS. Recommendations were made as to possible courses of action for EOD to pursue to obtain a more efficient ADS. Author

**N75-11450#** Army Foreign Science and Technology Center, Charlottesville, Va.

**USE OF A PANORAMIC AERIAL CAMERA IN AEROSURVEYING**

M. D. Konshin 25 Apr. 1974 9 p Transl. into ENGLISH from Geod. Kartografiya (USSR), no. 1, 1973 p 33-38

(AD-784162; FSTC-HT-23-0160-74) Avail: NTIS CSCL 08/2



## 08 INSTRUMENTATION AND SENSORS

The use of a panoramic aerial camera when carrying out aerial surveys is discussed. The photographic quality of the image is better due to the use of an exposure time of 1/3000 sec. The amount of field interpretation will be reduced and labor productivity will be increased by using the method suggested. GRA

**N75-11464#** Texas Instruments, Inc., Dallas. Equipment Group.  
**OIL-ON-WATER SENSOR Final Engineering Report**  
Kent McCormack, Gerald Fournier, and William Knight Feb. 1974 206 p refs  
(Contract DOT-CG-31888-A)  
(AD-784104; TI-UI-998200-01-F; USCG-D-87-74) Avail: NTIS CSCL 17/5

The Oil-on-Water Sensor system detects the presence of oil on water by emitting a wideband IR pulse and receiving reflections at two narrow spectral bands. Theory of operation is based on differences in the reflectance of water and oil at these narrow spectral bands. Ratio detection minimizes effects of surface wave action. This final report explains the principles of sensing, describes and explains the prototype equipment, and describes construction details of the Oil-on-Water Sensor. Finally, the report outlines the testing program that was used and provides data from these tests. Author (GRA)

**N75-11662\*** Oxford Univ. (England). Clarendon Lab.  
**INFRARED REMOTE SOUNDING**  
C. D. Rodgers In Calif. Univ. Proc. of the UCLA Intern. Conf. on Radiation and Remote Probing of the Atmosphere 1974 p 471-506 refs  
CSCL 04A

Atmospheric radiation was measured as a function of wavelength, position, angle, and time. Radiation was determined by temperature, cloud (aerosol), composition, and surface emissivity measurements. The theory of radiative transfer is reviewed, along with retrieval methods. Instruments onboard space probes for infrared remote sounding of planetary atmospheres are also described. J.A.M.

**N75-12283#** Research Inst. of National Defence, Stockholm (Sweden).  
**RECORDINGS OF THE SPECTRAL-RADIO-METER SIGNE DURING THE SUMMER OF 1972 [REGISTRERINGAR MED SPEKTORADIOMETERN 'SIGNE' UNDER SOMMAREN 1972]**  
Carl Hugo Agren Nov. 1972 22 p ref In SWEDISH  
(FOA-2-C-2577-E1) Avail: NTIS HC \$3.25

A technical description of the spectral radiometer is given that is intended for measuring at a distance. An account of its first recordings is presented together with its construction, calibration and operation. Practical problems in measuring are dealt with as well as different factors which effect measurements. In conclusion, a number of recordings are given of the spectral radiance and spectral reflections, mainly of vegetation and water. Author

**N75-12410#** Colorado School of Mines, Golden. Dept. of Geology.  
**INDEX OF SKYLAB DATA AVAILABLE AT COLORADO SCHOOL OF MINES**  
Keenan Lee, Principal Investigator and Gary L. Prost 31 Oct. 1974 32 p Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 EREP  
(Contract NAS9-13394)  
(E75-10041; NASA-CR-140778; Rept-74-8) Avail: NTIS HC \$3.75 CSCL 05B

**N75-12411#** Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.  
**IN SITU SPECTRORADIOMETRIC CALIBRATION OF EREP**

**IMAGERY AND OCEANOGRAPHY OF BLOCK ISLAND SOUND Progress Report, Apr. - Nov. 1974**  
E. Yost, Principal Investigator 15 Nov. 1974 6 p EREP  
(Contract NAS9-13308)  
(E75-10042; NASA-CR-140779) Avail: NTIS HC \$3.25 CSCL 08J

**N75-12418#** ESL, Inc., Sunnyvale, Calif.  
**EARTH RESOURCES SENSOR DATA HANDLING SYSTEM: NASA JSC VERSION Final Design Report**  
29 Apr. 1974 23 p  
(Contract NAS9-14077)  
(NASA-CR-140334; ESL-SR-132) Avail: NTIS HC \$3.25 CSCL 05B

The design of the NASA JSC data handling system is presented. Data acquisition parameters and computer display formats and the flow of image data through the system, with recommendations for improving system efficiency are discussed along with modifications to existing data handling procedures which will allow utilization of data duplication techniques and the accurate identification of imagery. N.R.

**N75-13366#** Purdue Univ., Lafayette, Ind. Lab. for Application of Remote Sensing.  
**SPECTRORADIOMETRIC AND MULTISPECTRAL SCANNER OVER LAKE MONROE Monthly Report, Oct. 1974**  
LeRoy F. Silva, Principal Investigator Oct. 1974 2 p EREP  
(Contract NAS9-13301)  
(E75-10066; NASA-CR-141006) Avail: NTIS HC \$3.25 CSCL 08H

**N75-13455#** Environmental Data Service, Washington, D.C.  
**CATALOG OF EARTHQUAKE PHOTOGRAPHS Key to Geophysical Records, Documentation No. 3**  
Jerry L. Coffman, comp. Nov. 1974 46 p  
Avail: NTIS HC \$3.75

This catalog represents a beginning effort to systematically collect photographs and maps from many sources and to make them generally available. This publication lists approximately 300 photographs and 200 maps on the subject of earthquakes and contains descriptions and examples of the collection. Many of the photographs show views of earthquake-damaged buildings, bridges, dams, and other man-made structures; several show spectacular landslides, rifts, and ground cracks resulting from destructive shocks. The maps depict intensity distribution of important earthquakes and the seismicity of areas throughout the world. Author

**N75-14199#** Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.  
**DESIGN DATA COLLECTION WITH SKYLAB/EREP MICROWAVE INSTRUMENT S-193 Monthly Letter Progress Report No. 13, Oct. 1974**  
Arun Sobti Oct. 1974 30 p EREP  
(Contract NAS9-13331)  
(E75-10080; NASA-CR-141104) Avail: NTIS HC \$3.75 CSCL 05B

The author has identified the following significant results. The Skylab S-193 radiometer/scatterometer collected thousands of measurements of scattering coefficient and brightness temperature over various parts of the United States during the summer of 1973 at angles of incidence between vertical and about 45 deg. These measurements have been combined to produce histograms of the response at each of several angles within this range, and to establish average scattering coefficient vs angle curves with 10% and 90% exceedance levels as well. The variation of the radiometric measurements is primarily in the region from 255 K to 285 K, with very few measurements giving values down to and even below 200 K. The scattering coefficient varies, for the mean, from about 0 db at 1 deg off

vertical to a low in the neighborhood of -10 db at 45 deg. The variability of the scattering coefficient measurements with this coarse resolution sensor is surprisingly small. The number of distinguishable levels is slightly more for the scatterometer than for the radiometer, but the amount of variation in brightness temperature caused by the physical temperature of the ground is enough so that the scatterometer can be used to distinguish significantly more meaningful levels than the radiometer.

**N75-14200\*** Environmental Research and Technology, Inc., Lexington, Mass.

**STUDY TO DEVELOP IMPROVED SPACECRAFT SNOW SURVEY METHODS USING SKYLAB/EREP DATA** Quarterly Progress Report, 15 Sep. - 15 Dec. 1974

James C. Barnes, Principal Investigator Dec. 1974 5 p EREP (Contract NAS9-13305)

(E75-10081; NASA-CR-141105; P-412-10; QPR-7) Avail: NTIS HC \$3.25 CSCL 08L

**N75-14238\*** Consiglio Nazionale delle Ricerche, Milan (Italy). Lab. per la Geofisica della Litosfera.

**CONTRIBUTION OF SPACE PLATFORMS TO A GROUND AND AIRBORNE REMOTE-SENSING PROGRAMME OVER ACTIVE ITALIAN VOLCANOES**

R. Cassinis, G. M. Lechi, and A. M. Tonelli /n ESRO European Earth-Resources Satellite Expts. May 1974 p 185-197 Sponsored by NASA

ERTS-1 imagery of the volcanic areas of southern Italy was used primarily for the evaluation of space platform capabilities in the domains of regional geology, soil and rock-type classification and, more generally, to study the environment of active volcanoes. The test sites were selected and equipped primarily to monitor thermal emission, but ground truth data was also collected in other domains (reflectance of rocks, soils and vegetation). The test areas were overflown with a two channel thermal scanner, while a thermo camera was used on the ground to monitor the hot spots. The primary goal of this survey was to plot the changes in thermal emission with time in the framework of a research program for the surveillance of active volcanoes. However, another task was an evaluation of emissivity changes by comparing the outputs of the two thermal channels. These results were compared with the reflectance changes observed on multispectral ERTS-1 imagery.

Author (ESRO)

**N75-14870#** Army Material Command, Texarkana, Tex. Intern Training Center.

**LIFE CYCLE COST STUDY OF ARMY SPECTROMETRIC OIL ANALYSIS PROGRAM (ASOAP) Final Report**

Henry L. Martin Apr. 1974 59 p refs (AD-786501; USAMC-ITC-02-08-73-018) Avail: NTIS CSCL 14/2

The scope of this paper is to determine the present life cycle cost (LCC) of ASOAP (Army Spectrometric Oil Analysis Program) based on certain assumptions. A cost model capable of determining the life cycle cost of ASOAP for both the atomic absorption spectrometry and the atomic emission spectrometry is developed. Next, using this cost model, the feasibility of the oil analysis program is determined. Finally, interest is focused on the benefits that the program has brought about in the past, and future benefits will be projected. A brief history of the Army's intervention into oil analysis, LCC, and cost models is presented. A brief discussion on the two methods of analysis that the Army uses and some estimations of various costs that are associated with ASOAP are included. A general cost model and a cost model for ASOAP is developed with a discussion of the various components. (Modified author abstract) GRA

**N75-15113\*** Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

**ANALYSIS OF SKYLAB MSS DATA, AND CALIBRATION OF THERMAL DATA OVER LAKE MONROE, INDIANA** Monthly Report, Dec. 1974

LeRoy F. Silva, Principal Investigator Dec. 1974 2 p EREP (Contract NAS9-13301)

(E75-10095; NASA-CR-141291) Avail: NTIS HC \$3.25 CSCL 08H

The author has identified the following significant results. The SL/4-S192 data over northern Indiana looks good. The thermal band looks very encouraging. The preliminary analysis indicates so far that it will be difficult to distinguish some land use classes because of the lack of vegetation. Preliminary analysis of the thermal band in particular indicates that there appears to be a correlation of the hot spots in the data over the Ft. Wayne, Indiana area and its industrial centers.

**N75-15119\*** National Oceanic and Atmospheric Administration, Rockville, Md. Coastal Mapping Div.

**SKYLAB: A PROPOSAL AEROTRIANGULATION WITH VERY SMALL SCALE PHOTOGRAPHY** Quarterly Report, 15 Oct. 1974 - 15 Jan. 1975

Morton Keller, Principal Investigator 15 Jan. 1975 1 p EREP

(NASA Order T-4110-B)

(E75-10101; NASA-CR-141297) Avail: NTIS HC \$3.25 CSCL 08B

**N75-15122\*** Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

**AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES** Monthly Progress Report, Dec. 1974

Roger M. Hoffer, Principal Investigator Dec. 1974 11 p EREP

(Contract NAS9-13380)

(E75-10104; NASA-CR-141305) Avail: NTIS HC \$3.25 CSCL 08F

The author has identified the following significant results. In the San Juan Mountains there exists a group of structural and topographic features which suggest a common origin. The relative positions of the San Juan Depression with the Silverton and Lake City Calderas indicate they are possibly on the edge of a large circular feature. Comparison with the 1:250,000 scale Durango Geologic Map reveals a series of radial and arcuate faults concentric with the major circular feature. Such a fracture pattern implies that the circular feature may represent the extent of a major domal uplift in the area. The uplift was very likely due to the sub-crustal emplacement of the parent magma of the San Juan volcanics and intrusives. The broad doming led to the formation of a zone of tensional ring fractures which acted as conduits of release for the magma and the eventual development of the various calderas. The ring fracturing was probably incomplete with hinging occurring in the southern and southwestern portions of the dome accounting for the lack of development of caldera structures in that portion of the area.

**N75-15131\*** Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.

**INVESTIGATION OF TRANSIENT EARTH RESOURCES PHENOMENA: CONTINUATION STUDY** Final Report, 31 Jan. - 30 Sep. 1974

Gary C. Goldman et al Nov. 1974 125 p refs

(Contract NAS5-20021)

(NASA-CR-139163; ERIM-107400-2-F) Avail: NTIS HC \$5.25 CSCL 08E

Calculated sensitivity requirements for an earth resource satellite in a geostationary orbit are reported. Radiance levels at the satellite sensor were computed for twenty top-priority Synchronous Earth Observatory Satellite (SEOS) applications. The observation requirements were reviewed and re-evaluated in terms of spectral band definition, spectral signatures of targets and backgrounds, observation time, and site location. With these data and an atmospheric attenuation and scattering model, the

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total radiances observed by the SEOS sensor were calculated as were the individual components contributed by the target, target variations, and the atmosphere. Author

**N75-15136\*#** Scientific Translation Service, Santa Barbara, Calif.  
**FUNDAMENTALS OF THE SPACE INDICATION OF EARTH RESOURCES**

V. V. Andreyanov Washington NASA Jan. 1975 62 p Transl. into ENGLISH from the Russian report D-171 (Contract NASw-2483) (NASA-TT-F-16108; D-171) Avail: NTIS HC \$4.25 CSCL 08E

The methods and instrumentation used in satellite reconnaissance of earth features are reviewed. The electromagnetic spectrum of solar radiation is analyzed along with the atmospheric effects on the transmission of visible and infrared radiation. Statistical methods are given for the identification of natural features and the determination of their characteristics. Remote sensing and data transmission requirements for satellites and the affect of orbit parameters on the results and condition of measurements is given. The principles of operation and the characteristics of photographic and television cameras, scanning radiometers, and active radar methods for the investigation of earth's resources are discussed. Author

**N75-15138\*#** Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.  
**MULTISPECTRAL PHOTOGRAPHY FOR EARTH RESOURCES**

Sondra Wenderoth, Edward Yost, Rajender Kalra, and Robert Anderson 1972 279 p refs Original contains color illustrations (Contract NAS9-11188) (NASA-CR-141283) Avail: NTIS HC \$8.75 CSCL 14E

A guide for producing accurate multispectral results for earth resource applications is presented along with theoretical and analytical concepts of color and multispectral photography. Topics discussed include: capabilities and limitations of color and color infrared films; image color measurements; methods of relating ground phenomena to film density and color measurement; sensitometry; considerations in the selection of multispectral cameras and components; and mission planning. F.O.S.

**N75-15333\*#** Rice Univ., Houston, Tex. Inst. for Computer Services and Applications.  
**EARTH RESOURCES DATA ANALYSIS PROGRAM, PHASE 2 Final Report, Jun. 1973 - May 1974**  
Jun. 1974 38 p ref (Contract NAS9-12776) (NASA-CR-141477; Rept-275-025-FP2) Avail: NTIS HC \$3.75 CSCL 09B

The efforts and findings of the Earth Resources Data Analysis Program are summarized. Results of a detailed study of the needs of EOD with respect to an applications development system (ADS) for the analysis of remotely sensed data, including an evaluation of four existing systems with respect to these needs are described. Recommendations as to possible courses for EOD to follow to obtain a viable ADS are presented. Algorithmic development comprised of several subtasks is discussed. These subtasks include the following: (1) two algorithms for multivariate density estimation; (2) a data smoothing algorithm; (3) a method for optimally estimating prior probabilities of unclassified data; and (4) further applications of the modified Cholesky decomposition in various calculations. Little effort was expended on task 3, however, two reports were reviewed. Author

## 09 GENERAL

Includes economic analysis.

**A75-12030 \* #** Planning and management of science programs on Skylab. R. A. R. Parker and J. R. Sevier (NASA, Johnson Space Center, Houston, Tex.). *American Institute of Aeronautics and Astronautics and American Geophysical Union, Conference on Scientific Experiments of Skylab, Huntsville, Ala., Oct. 30-Nov. 1, 1974, AIAA Paper 74-1215*. 6 p.

Discussion of the experience gained in experiment operation planning during the Skylab mission. The Skylab flight planning activity allowed the experimenters to interact with the system and provided the flexibility to respond to contingencies both major and minor. Both these aspects contributed to make efficient use of crew time thus helping to increase the science return from the mission. Examples of the need for real time scheduling response and of the tradeoffs considered between conflicting experiment requirements are presented. General management principles derived from this experience are developed. The Skylab mission experiences, together with previous Apollo mission experiences, are shown to provide a good background for Shuttle flight planning. M.V.E.

**A75-12986** Energy development; Proceedings of the Energy Sources Conference, Anaheim, Calif., July 14-19, 1974. Conference sponsored by the Institute of Electrical and Electronics Engineers, New York, Institute of Electrical and Electronics Engineers, Inc., 1974. 104 p. Members, \$7.50; nonmembers, \$10.00.

The impact of advanced batteries on electric power generation, tidal power and its integration into the electric system, and utilization of municipal refuse for the recovery of energy and other resources are among the topics covered in papers concerned with the latest developments in power engineering research. Other topics covered include current expectations for fusion power from toroidal machines, progress in coal gasification, and pumped air storage for electric power generation.

M.V.E.

**A75-12999** U.S. energy resources - Outlook for the future. R. A. Budenholzer (Illinois Institute of Technology, Chicago, Ill.). In: Energy development; Proceedings of the Energy Sources Conference, Anaheim, Calif., July 14-19, 1974. New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 98-102. 5 refs.

Assessment of the extent and nature of the present energy crisis, and search for courses of action that could alleviate the situation on both a short-term and long-term basis. Reviewed estimates of the number of years of supply remaining for each of the various fuel resources in the United States show that coal and uranium are much more abundant than crude oil and natural gas. For the immediate future, this suggests a gradual shift of all power generation to coal and nuclear energy, thus conserving oil and gas for higher priority uses. For the long range future, it is hoped that fusion power can be achieved commercially. M.V.E.

**A75-13581** ERTS-1 and data for national land use planning. J. R. Anderson (U.S. Geological Survey, Reston, Va.). In: Technology today for tomorrow; Proceedings of the Eleventh Space Congress, Cocoa Beach, Fla., April 17-19, 1974. Volume 1.

Cape Canaveral, Fla., Canaveral Council of Technical Societies, 1974, p. 3-25 to 3-28. 8 refs.

An Earth Resources Technology Satellite can provide information about existing land use at a relatively generalized level of presentation on a timely repetitive basis. A land use classification

system has been developed to meet the needs for an up-to-date overview of land use throughout the country. The ERTS-1 capabilities for obtaining required land use data are discussed. It has been found that land use maps of a large scale can be produced by the machine processing of ERTS-1 scanner data. G.R.

**A75-13592 \*** NASA-KSC's earth resources benefits from space exploration. J. M. Ragusa and E. J. Hecker (NASA, Kennedy Space Center, Earth Resources Branch, Cape Canaveral, Fla.). In: Technology today for tomorrow; Proceedings of the Eleventh Space Congress, Cocoa Beach, Fla., April 17-19, 1974. Volume 2.

Cape Canaveral, Fla., Canaveral Council of Technical Societies, 1974, p. 2-9 to 2-14.

The purpose of this paper is to identify the nature and scope of earth resources activities at the Kennedy Space Center (KSC). Because of recent developments from space exploration, NASA and KSC have evolved an earth resources program which focuses on applied R&D activities of direct benefit to a variety of federal, state, and local users. The historical development of this program is traced, and several projects are identified with special emphasis on the use of sidelooking airborne radar in several Brevard County, Florida test areas.

(Author)

**A75-13618 \*** Skylab contributions to the future. W. C. Schneider and J. H. Disher (NASA, Office of Manned Space Flight, Washington, D.C.). *International Astronautical Federation, International Astronautical Congress, 25th, Amsterdam, Netherlands, Sept. 30-Oct. 5, 1974, Paper. 57 p.*

Skylab showed that a multidisciplinary manned space station is practical and can be highly productive. Quality data was produced concerning earth resources (mineral resources, agriculture, climatology, etc.), solar astronomy (solar activity, magnetic fields, and solar winds), materials sciences (e.g., zero-gravity crystal growth), and astronomy and astrophysics (including observations of comet Kohoutek). Two types of astronaut maneuvering unit were tested. Medical data are applicable to adaptational environmental physiology. A.T.S.

**A75-13761** The potential benefits for development derived from space applications. V. Skatchkov (United Nations, Outer Space Affairs Div., New York, N.Y.). *International Astronautical Federation, International Astronautical Congress, 25th, Amsterdam, Netherlands, Sept. 30-Oct. 5, 1974, Paper 74-147*. 16 p. 12 refs.

Potential benefits from using space systems for communications, navigation, meteorology, and remote sensing of earth resources are considered. Developing countries will derive the greatest benefit from remote sensing from space as applied to agriculture, fisheries, pollution and erosion monitoring, exploration for minerals, etc. Great cost effectiveness of such programs is predicted. Centralized international ground segments for the systems is recommended. System costs and possible sources of investment are examined.

A.T.S.

**A75-13770** Economic effectiveness of using the space systems of distant indication of natural resources. S. A. Sarkisian, E. S. Minaev, S. S. Korunov, and O. U. Kurdinovskii. *International Astronautical Federation, International Astronautical Congress, 25th, Amsterdam, Netherlands, Sept. 30-Oct. 5, 1974, Paper 74-165*. 26 p.

Remote sensing of natural resources from space can be used in various areas of interest to the national economy, such as geology, forestry, agriculture, water economy, fisheries, etc. Users' economy requirements are most important in devising such space systems. Equations are derived for calculating the total economic effect of substituting space-based systems for traditional means. A technique

for estimating economic effectiveness is outlined. The example of the fishing industry indicates that reduction of the search fleet, increased catches, exploitation of additional ocean areas, and decreased searching time are possible through use of remote sensing from space. A.T.S.

**A75-15319 #** The radio emission of the earth as a planet (Radioizluchenie zemli kak planety). A. E. Basharinov, A. S. Gurvich, and S. T. Egorov. Moscow, Izdatel'stvo Nauka, 1974. 188 p. 185 refs. In Russian.

The present work sets forth the basic principles of measurements of the earth's thermal microwave radiation, with special emphasis on satellite techniques. The characteristics of the formation of microwave radiation in the system comprised of the atmosphere and the earth's surface are studied. Aspects of this kind of investigation having practical importance are covered, such as the determination of air humidity, cloud water content, glacier compactness, and the humidity and temperature of land masses. P.T.H.

**A75-17103 #** Estimation of population density in Tokyo districts from ERTS-1 data. S. Murai (Tokyo, University, Tokyo, Japan). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 13-22.

Study of the feasibility of estimating population density in Tokyo districts by using the multispectral characteristics of urbanized areas, low populated areas, such as forest or crop field, and unpopulated areas, such as seas, lakes, or mountains, in the two-dimensional signature space of MSS 5 and MSS 7. Two-dimensional histograms have been acquired for four different classes of population density, and the correlation between density signals of 9.5 in. transparencies of MSS 5 and MSS 7, and population density data taken from the census in 1965, has been analyzed for Tokyo districts consisting of 180 by 160 grids of 1 kilometer interval. From this correlation, seven decision regions have been established in the two-dimensional signature space of MSS 5 and MSS 7. The accuracy of estimation of population density is approximately 90%, in spite of the existence of misregistration and low resolution due to the use of a 1-mm aperture in the density measurement for the 9.5 in. transparencies. Misregistered points and unresolved points near boundaries of water bodies have been eliminated. The accuracy will be improved if video signals stored in the MSS digital tape are available. (Author)

**A75-17118 #** Land-use planning aided by computer cellular modelling/mapping system to combine remote sensing, natural resources, social and economic data. H. W. Smedes (U.S. Geological Survey, Denver, Colo.), G. Nez (Federation of Rocky Mountain States, Denver, Colo.), A. K. Turner (Colorado School of Mines, Golden, Colo.), J. C. Reed, Jr. (U.S. Geological Survey, Reston, Va.), and E. E. Lutzen. In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 289-298.

**A75-17123 #** ERTS applications in Thailand - A progress report. P. Angsuwatana (Ministry of Industry, Dept. of Mineral Resources), C. Boonyobhas, B. Klankamsorn, M. Omakupt, P. Piyaongse (Ministry of Agriculture and Cooperatives), J. Morgan (U.S. Geological Survey, Washington, D.C.), K. Suvarnasudhi, and S. Vibulsresth (Applied Scientific Research Corporation of Thailand,

Bangkok, Thailand). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 1. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 341-361.

Analyses of ERTS-1 imagery conducted by four Royal Thai Government agencies responsible for survey, inventory, and development of natural resources are described. Visual interpretation of single band and color composite images was augmented and verified by ground checks and aerial photographs. Preliminary computer printouts of one scene have been found accurate and useful. Agriculture, forestry, land use, and geological mapping are illustrated. The work will be reported in more detail to NASA (SR No. 9620). (Author)

**A75-17166 \* #** The economic impact of remote sensing data as the source of nonpoint pollution monitoring and control. W. L. Miller (Purdue University, West Lafayette, Ind.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1001-1011. 13 refs. Grant No. NGL-15-005-112.

Nonpoint pollution of streams with sediment as a result of runoff from alternative uses of land has become a socially unacceptable product of economic activity. This report describes a research approach to economically achieve correction of the nonpoint pollution problem. The research approach integrates the economic model with those data which may be obtainable from remotely sensed sources. The economic problem involves measurement of the direct benefits and costs associated with the changes in land management activities necessary to reduce the level of nonpoint pollution. Remotely sensed data from ERTS-1 may provide some of the information required for the economic model which indicates efficient solutions to the nonpoint pollution problem. Three classes of data (i.e., soil categories, vegetative cover, and water turbidity) have the potential to be measured by ERTS-1 systems. There is substantial research which indicates the ability of ERTS-1 to measure these classes of data under selected conditions. (Author)

**A75-17211 \* #** Summary of flight performance of the Skylab Earth Resources Experiment Package /EREP/. A. E. Potter, C. K. Williams, A. L. Grandfield, K. J. Demel, M. C. Trichel, T. L. Barnett, R. D. Juday, W. E. Hensley, N. M. Hatcher, and W. E. McAllum (NASA, Johnson Space Center, Houston, Tex.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 1803-1846. 17 refs.

A group of six remote sensor systems (sensing visible, infrared, and microwave radiation) known as the Earth Resources Experiment Package (EREP) was flown on the NASA Skylab spacecraft to furnish data to numerous investigators in the earth sciences and in technology assessment. Inflight sensor performance in three categories (functional, geometric, and radiometric) was evaluated using: (1) ground measurements of surface, atmospheric, and illumination parameters; (2) ground deployment and operation of microwave receivers and transponders to monitor and excite the active EREP sensors; (3) measurement of surface and atmospheric parameters by instrumented aircraft on underflights of Skylab passes; and (4) analysis of the actual flight data. This resulted in identification and correction of anomalous sensor operation, quantization of geometric distortions or aberrations, improvement or confirmation of calibrations, and determination of sensitivity, accuracy, and stability of the sensors. (Author)

**A75-17235 #** An overview of Texas activities in remote sensing. R. N. Neece (General Land Office, Austin, Tex.), M. Ellis (Texas Water Development Board, Austin, Tex.), and J. Wells

(Interagency Council on Natural Resources and the Environment, Austin, Tex.). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 2107-2112.

**A75-17236 \*** # A summary of ERTS data applications in Alaska. J. M. Miller and A. E. Belon (Alaska, University, Fairbanks, Alaska). In: International Symposium on Remote Sensing of Environment, 9th, Ann Arbor, Mich., April 15-19, 1974, Proceedings. Volume 3. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1974, p. 2113-2138. 14 refs. NASA-supported research.

ERTS has proven to be an exceedingly useful tool for the preparation of urgently needed resource surveys in Alaska. For this reason the wide utilization of ERTS data by federal, state and industrial agencies in Alaska is increasingly directed toward the solution of operational problems in resource inventories, environmental surveys, and land use planning. Examples of some applications are discussed in connection with surveys of potential agricultural lands; mapping of predicted archaeological sites; permafrost terrain and augeis mapping; snow melt enhancement from Prudhoe Bay roads; geologic interpretations correlated with possible new petroleum fields, with earthquake activity, and with plate tectonic motion along the Denali fault system; hydrology in monitoring surging glaciers and the break-up characteristics of the Chena River watershed; sea-ice morphology correlated with marine mammal distribution; and coastal sediment plume circulation patterns.

(Author)

**N75-10533\*** # National Research Council, Bangkok (Thailand). **THAILAND NATIONAL PROGRAMME OF THE EARTH RESOURCES TECHNOLOGY SATELLITE** Pradisth Cheosakul, Principal Investigator Aug. 1973 14 p Sponsored by NASA ERTS (E74-10806; NASA-CR-140500) Avail: NTIS HC \$3.25 CSCL 08F

**N75-10534\*** # National Research Council, Bangkok (Thailand). **THE THAILAND PROGRAMME OF THE EARTH RESOURCES TECHNOLOGY SATELLITE Progress Report** Pradisth Cheosakul, Principal Investigator [1974] 3 p Sponsored by NASA ERTS (E74-10807; NASA-CR-140501; PR-1) Avail: NTIS HC \$3.25 CSCL 08F

**N75-10546\*** # General Electric Co., Philadelphia, Pa. Space Div. **ERTS 1 FLIGHT EVALUATION REPORT, 23 OCTOBER 1973 - 23 JANUARY 1974** 26 Feb. 1974 123 p (Contract NAS5-21808) (NASA-CR-140712; Doc-74SD4205). Avail: NTIS HC \$5.25 CSCL 05A

Detailed analyses are given of flight performance of ERTS-1 systems and subsystems during orbits 6371 to 7651. A.L.

**N75-10547\*** # General Electric Co., Philadelphia, Pa. Space Div. **ERTS 1 FLIGHT EVALUATION REPORT, 23 JANUARY - 23 APRIL 1974** 18 May 1974 141 p (Contract NAS5-21808) (NASA-CR-140810; DOC-74SD4217) Avail: NTIS HC \$5.75 CSCL 05A

Detailed analyses are given of flight performance of ERTS-1 systems and subsystems during orbits 7652 to 8907. A.L.

**N75-10548\*** # General Electric Co., Philadelphia, Pa. Space Div.

**ERTS 1 FLIGHT EVALUATION REPORT, JANUARY 23, 1973 TO APRIL 23, 1973**

29 May 1973 196 p

(Contract NAS5-21808)

(NASA-CR-140809; Doc-73SD4249) Avail: NTIS HC \$7.00 CSCL 22C

Detailed analyses are given of the performance of systems and subsystems on board ERTS-1 during orbits 2600-3810.

A.L.

**N75-10549\*** # National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**THIRD EARTH RESOURCES TECHNOLOGY SATELLITE SYMPOSIUM. VOLUME 2: SUMMARY OF RESULTS**

Stanley C. Freden, ed., Enrico P. Mercanti, ed., and David B. Friedman, ed. Washington May 1974 184 p refs Symp. held at Washington, D. C., 10-14 Dec. 1973 Original contains color illustrations

(NASA-SP-356) Avail: NTIS MF \$2.25; SOD HC \$3.00 CSCL 05B

Summaries are provided of significant results taken from presentations at the symposium along with some typical examples of the applications of ERTS-1 data for solving resources management problems at the national, state, and local levels.

**N75-10550\*** Canada Centre for Remote Sensing, Ottawa (Ontario).

**THE CANADIAN ERTS PROGRAM**

Lawrence W. Morley /In NASA. Goddard Space Flight Center Third ERTS Symp., Vol. 2 May 1974 p 7-11

CSCL 05B

Under a four-year collaborative agreement between the United States and Canada, the Canada Centre for Remote Sensing (CCRS) reads out and distributes the ERTS data of Canada. The Canadian receiving station is at Prince Albert, Saskatchewan, and covers most of Canada except for the East Coast. Production statistics on Canadian ERTS imagery, a summary of several cost benefit case histories, and recommendations for the future of the international aspects of ERTS are discussed and evaluated.

Author

**N75-10568\*** # General Electric Co., Philadelphia, Pa. Space Div.

**ERTS 1 FLIGHT EVALUATION REPORT, 23 APRIL 1974-23 JULY 1974**

15 Aug. 1974 219 p

(Contract NAS5-21808)

(NASA-CR-140711; Doc-74SD4236) Avail: NTIS HC \$7.25 CSCL 05A

Detailed analyses are given of flight performance of ERTS-1 systems and subsystems during orbits 8908 to 10182. A.L.

**N75-10617\*** # Committee on Interior and Insular Affairs (U. S. Senate).

**NATIONAL ENVIRONMENTAL POLICY ACT OF 1969. ENVIRONMENTAL INDICES, STATUS OF DEVELOPMENT PURSUANT TO SECTIONS 102(2)(B) AND 204 OF THE ACT**

James W. Curlin Washington GPO 1973 54 p refs Presented to Comm. on Interior and Insular Affairs, 93d Congr., 1st Sess., Dec. 1973 Prepared by the Library of Congr., Environ. Policy Div.

(GPO-25-314) Avail: SOD HC \$0.55

Developments in the design of environmental indices for monitoring the environment are reported. Topics discussed include: indicators and indices, environmental components, obstacles to the development of indices and indicators, air quality index, land use index, and noise pollution index. F.O.S.

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**N75-10967\*** National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

### **MSFC INTEGRATED EXPERIMENTS PRELIMINARY REPORT**

Nov. 1974 146 p refs  
(NASA-TM-X-64881) Avail: NTIS HC \$5.75 CSCL 22C

Skylab experiments are described and their preliminary results are reported. The types of experiments described include medical, earth resources, space physics, space manufacturing, and spacecraft design. Author

**N75-11406\*** Catholic Univ. of America, Washington, D.C. Dept. of Anthropology.

### **EARTH RESOURCES TECHNOLOGY SATELLITE-1 (ERTS-1) DATA AND ANTHROPOLOGY: USE OF THESE DATA IN CARRYING CAPACITY ESTIMATES FOR SITES IN UPPER VOLTA AND NIGER**

Priscilla Reining, Principal Investigator 24 Nov. 1974 10 p  
Presented at the Amer. Anthropological Assoc. Meeting, Mexico City, 24 Nov. 1974 ERTS  
(Contract NAS5-21970)  
(E75-10001; NASA-CR-140687) Avail: NTIS HC \$3.25 CSCL 08H

The author has identified the following significant results. Repetitively derived multispectral band imagery from ERTS-1 is now available for many parts of the earth's land surface and represents major new data sources for anthropological work in habitat, land use, and settlement patterns. A completed first step test of ERTS-1 data is available in carrying capacity estimates for Mossi, Hausa, and Sonrai sites derived from: (1) field work; (2) aerial photography; and (3) ERTS-1. Data can test more than one carrying capacity formula.

**N75-11414\*** Mississippi State Univ., State College.  
**APPLICATION OF REMOTE SENSING TO STATE AND REGIONAL PROBLEMS** Semiannual Progress Report, 1 May - 31 Oct. 1974

W. Frank Miller, C. W. Bouchillon, J. C. Harris, Brad Carter, Frank Whisler, and Randall Robinette 31 Oct. 1974 24 p refs  
(Grant NGL-25-001-054)  
(NASA-CR-140805; SAPR-2) Avail: NTIS HC \$3.25 CSCL 08B

The primary purpose of the remote sensing applications program is for various members of the university community to participate in activities that improve the effective communication between the scientific community engaged in remote sensing research and development and the potential users of modern remote sensing technology. Activities of this program are assisting the State of Mississippi in recognizing and solving its environmental, resource and socio-economic problems through inventory, analysis, and monitoring by appropriate remote sensing systems. Objectives, accomplishments, and current status of the following individual projects are reported: (1) bark beetle project; (2) state park location planning; and (3) waste source location and stream channel geometry monitoring. Author

**N75-11549\*** California Univ., Los Angeles.  
**PROCEEDINGS OF THE UCLA INTERNATIONAL CONFERENCE ON RADIATION AND REMOTE PROBING OF THE ATMOSPHERE**

Jacob G. Kuriyan, ed. 1974 422 p refs Conf. held at Los Angeles, 28-30 Aug. 1973 Sponsored by DOT, NASA, TRW Systems, and Army  
(NASA-CR-140816) Avail: NTIS HC \$10.50 CSCL 04A

Various articles are presented on multiple scattering problems and radiative transfer in the atmosphere. Particle size distribution and molecular absorption are also discussed.

**N75-12019\*** National Aeronautics and Space Administration, Washington, D.C.  
**THE FINAL SKYLAB MISSION: MAN AT HOME AND AT WORK IN SPACE**

15 Feb. 1974 8 p  
(NASA-TM-X-70394; MR-15) Avail: NTIS HC \$3.25 CSCL 22C

The accomplishments of the Skylab 4 mission are discussed. The medical experiments and dietary aspects of the mission are reported. The observation of the Comet Kohoutek is described. The remote sensing of earth resources is examined to show the areas of coverage. The repair of the space station and the accomplishment of unscheduled requirements are discussed. Statistical data of all the Skylab missions are tabulated. Author

**N75-12390\*** Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.

### **AN INTERDISCIPLINARY ANALYSIS OF MULTISPECTRAL SATELLITE DATA FOR SELECTED COVER TYPES IN THE COLORADO MOUNTAINS, USING AUTOMATIC DATA PROCESSING TECHNIQUES** Monthly Progress Report, Oct. 1974

Roger M. Hoffer, Principal Investigator Oct. 1974 7 p EREP  
(Contract NAS9-13380)  
(E75-10002; NASA-CR-140688) Avail: NTIS HC \$3.25 CSCL 08F

The author has identified the following significant results. Documentation is presented of the capability of the middle infrared portion of the electromagnetic spectrum to spectrally differentiate clouds from snow. Other portions of the spectrum cannot provide this capability.

**N75-12416\*** Committee on Science and Astronautics (U. S. House).

### **EARTH RESOURCES SURVEY SYSTEM**

Washington GPO 1974 286 p refs Hearings on H.R. 14978 and H.R. 15781 before Subcomm. on Space Sci. and Appl. of Comm. on Sci. and Astronaut., 93d Congr., 2d Sess., No. 46, 3, 4, and 9 Oct. 1974

(GPO-41-665) Avail: Subcomm. on Space Sci. and Appl.

The hearings to explore the desirability of creating an operational satellite system for surveying the earth's resources are reported. The ERTS program is reviewed, and the technology for data acquisition, dissemination, and utilization are assessed along with remote sensing techniques. F.O.S.

**N75-12424\*** ECON, Inc., Princeton, N.J.  
**IMPROVED (ERTS) INFORMATION AND ITS IMPACT ON U.S. MARKETS FOR AGRICULTURAL COMMODITIES: A QUANTITATIVE ECONOMIC INVESTIGATION OF PRODUCTION, DISTRIBUTION AND NET EXPORT EFFECTS** 31 Oct. 1974 154 p refs  
(Contract NASw-2558)  
(NASA-CR-141044; Rept-74-2001-6) Avail: NTIS HC \$6.25 CSCL 05B

An econometric investigation into the markets for agricultural commodities is summarized. An overview of the effort including the objectives, scope, and architecture of the analysis and the estimation strategy employed is presented. The major empirical results and policy conclusions are set forth. These results and conclusions focus on the economic importance of improved crop forecasts, U.S. exports, and government policy operations. A number of promising avenues of further investigation are suggested. Author

**N75-13010\*** Committee on Aeronautical and Space Sciences (U. S. Senate).

### **EARTH RESOURCES SATELLITES**

Washington GPO 1974 341 p refs Hearings on S. 2350 and S. 3484 before Comm. on Aeron. and Space Sci., 93d Congr., 2d Sess., 6, 8, and 9 Aug. and 18 Sep. 1974  
(GPO-40-560) Avail: SOD HC \$3.00

The arguments for and against the expansion of earth resources satellite capabilities and preparation for an operational satellite system were presented in a hearing before Congress whose purpose was to gather information on two impending

bills which would increase the federal government's activities in remote sensing programs. Significant accomplishments of ERTS 1 are reviewed, along with some potential capabilities which are as yet unexplored. The ways in which ERTS data is being used are also described, with emphasis on the role of the EROS Data Center in Sioux Falls, S. Dak. in disseminating information of use to farmers, environmental experts, regional planners, and researchers. Plans for an operational earth resources satellite system, which is expected to become a more pressing issue with the launch of ERTS-B, are discussed in terms of public vs. private control and the possibility that such a system will present difficulties in foreign relations. A.A.D.

**N75-13370\*** National Aeronautics and Space Administration, Washington, D.C.

**ERTS-B (EARTH RESOURCES TECHNOLOGY SATELLITE)**  
14 Jan. 1975 74 p  
(NASA-News-Release-74-329) Avail: NASA Scientific and Technical Information Facility, P. O. Box 33, College Park, Md. 20740 CSCL 05B

Mission plans and objectives of the ERTS 2 Satellite are presented. ERTS 2 follow-on investigations in various scientific disciplines including agriculture, meteorology, land-use, geology, water resources, oceanography, and environment are discussed. Spacecraft design and its sensors are described along with the Delta launch vehicle and launch operations. Applications identified from ERTS 1 investigations are summarized. J.M.S.

**N75-13373\*** Earth Satellite Corp., Washington, D.C.  
**THE ERTS COST-BENEFIT STUDY** Quarterly Report, Feb. Apr. 1974

May 1974 44 p  
(Contract DI-14-08-0001-13519)  
(PB-234065/1; USGS-DO-74-010; QR-5) Avail: NTIS HC \$3.75 CSCL 08F

The report makes an assessment of potential benefits in marine resources management and analytical work for the case studies in land use, forestry and environmental monitoring. Interim case study reports were drafted, mission profiles for case studies to be used in developing alternative system costs and analyzing cloud cover were developed. GRA

**N75-14203\*** ECON, Inc., Princeton, N.J.  
**THE ECONOMIC VALUE OF REMOTE SENSING OF EARTH RESOURCES FROM SPACE: AN ERTS OVERVIEW AND THE VALUE OF CONTINUITY OF SERVICE. VOLUME 1: SUMMARY**

George A. Hazelrigg, Jr. and Klaus P. Heiss 20 Dec. 1974 82 p  
(Contract NASw-2580)  
(NASA-CR-141268; Rept-74-2002-10-1-Vol-1) Avail: NTIS HC \$4.75 CSCL 05C

An overview of the ERTS program is given to determine the magnitude of the benefits that can be reasonably expected to flow from an Earth Resources Survey (ERS) Program, and to assess the benefits foregone in the event of a one or two-year gap in ERS services. An independent evaluation of the benefits attributable to ERS-derived information in key application areas is presented. These include two case studies in agriculture-distribution, production and import/export, and one study in water management. The cost-effectiveness of satellites in an ERS system is studied by means of a land cover case study. The annual benefits achievable from an ERS system are measured by the in-depth case studies to be in the range of \$430 to \$746 million. Benefits foregone in the event of a one-year gap in ERS service are estimated to be \$147 to \$220 million and \$274 to \$420 million for a two-year gap in ERS service. Author

**N75-14204\*** ECON, Inc., Princeton, N.J.  
**THE ECONOMIC VALUE OF REMOTE SENSING BY SATELLITE: AN ERTS OVERVIEW AND THE VALUE OF**

**CONTINUITY OF SERVICE. VOLUME 2: SOURCE DOCUMENT**

John Andrews, Alan Donziger, Jr. George A. Hazelrigg, Klaus Heiss, Francis Sand, and Peter Stevenson 20 Dec. 1974 186 p refs

(Contract NASw-2580)  
(NASA-CR-141193; Rept-74-2002-10-2-Vol-2) Avail: NTIS HC \$7.00 CSCL 05C

The economic value of an ERS system with a technical capability similar to ERTS, allowing for increased coverage obtained through the use of multiple active satellites in orbit is presented. A detailed breakdown of the benefits achievable from an ERS system is given and a methodology for their estimation is established. The ECON case studies in agriculture, water use, and land cover are described along with the current ERTS system. The cost for a projected ERS system is given. Author

**N75-14205\*** ECON, Inc., Princeton, N.J.  
**THE ECONOMIC VALUE OF REMOTE SENSING OF EARTH RESOURCES FROM SPACE: AN ERTS OVERVIEW AND THE VALUE OF CONTINUITY OF SERVICE. VOLUME 3: INTENSIVE USE OF LIVING RESOURCES: AGRICULTURE. PART 1: OVERVIEW**

Alain L. Kornhauser and Lawrence B. Wilson 20 Dec. 1974 148 p

(Contract NASw-2580)  
(NASA-CR-141265; Rept-74-2002-10-Vol-3-Pt-1) Avail: NTIS HC \$5.75 CSCL 05C

Potential economic benefits obtainable from a state-of-the-art ERS system in the resource area of intensive use of living resources, agriculture, are studied. A spectrum of equal capability (cost saving), increased capability, and new capability benefits are quantified. These benefits are estimated via ECON developed models of the agricultural marketplace and include benefits of improved production and distribution of agricultural crops. It is shown that increased capability benefits and new capability benefits result from a reduction of losses due to disease and insect infestation given ERS's capability to distinguish crop vigor and from the improvement in world trade negotiations given ERS's worldwide surveying capability. Author

**N75-14206\*** ECON, Inc., Princeton, N.J.  
**THE ECONOMIC VALUE OF REMOTE SENSING OF EARTH RESOURCES FROM SPACE: AN ERTS OVERVIEW AND THE VALUE OF CONTINUITY OF SERVICE. VOLUME 3: INTENSIVE USE OF LIVING RESOURCES, AGRICULTURE. PART 2: DISTRIBUTION EFFECTS**

David F. Bradford and Harry H. Kelejian 31 Oct. 1974 115 p refs

(Contract NASw-2558)  
(NASA-CR-141194; Rept-74-2002-10-Vol-3-Pt-2) Avail: NTIS HC \$5.25 CSCL 05C

The results of an investigation of the value of improving information for forecasting future crop harvests are described. A theoretical model is developed to calculate the value of increased speed of availability of that information. The analysis of U.S. domestic wheat consumption was implemented. New estimates of a demand function for wheat and of a cost of storage function were involved, along with a Monte Carlo simulation for the wheat spot and future markets and a model of market determinations of wheat inventories. Results are shown to depend critically on the accuracy of current and proposed measurement techniques. Author

**N75-14207\*** ECON, Inc., Princeton, N.J.  
**THE ECONOMIC VALUE OF REMOTE SENSING OF EARTH RESOURCES FROM SPACE: AN ERTS OVERVIEW AND THE VALUE OF CONTINUITY OF SERVICE. VOLUME 3: INTENSIVE USE OF LIVING RESOURCES, AGRICULTURE. PART 3: THE INTEGRATED IMPACT OF IMPROVED (ERS) INFORMATION ON US AGRICULTURAL COMMODITIES**

Andrew D. Seidel 20 Dec. 1974 159 p refs  
(Contract NASw-2580)

(NASA-CR-141262; Rept-74-2002-10-Vol-3-Pt-3) Avail: NTIS HC \$6.25 CSCL 05C

The economic value of information produced by an assumed operational version of an earth resources survey satellite of the



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ERTS class is assessed. The theoretical capability of an ERTS system to provide improved agricultural forecasts is analyzed and this analysis is used as a reasonable input to the econometric methods derived by ECON. An econometric investigation into the markets for agricultural commodities is summarized. An overview of the effort including the objectives, scopes, and architecture of the analysis, and the estimation strategy employed is presented. The results and conclusions focus on the economic importance of improved crop forecasts, U.S. exports, and government policy operations. Several promising avenues of further investigation are suggested. Author

**N75-14208\*** ECON, Inc., Princeton, N.J.  
**THE ECONOMIC VALUE OF REMOTE SENSING OF EARTH RESOURCES FROM SPACE: AN ERTS OVERVIEW AND THE VALUE OF CONTINUITY OF SERVICE. VOLUME 4: FORESTRY, WILDLIFE AND RANGELAND**  
John Andrews and Peter Stevenson 31 Oct. 1974 136 p refs  
(Contract NASw-2580)  
(NASA-CR-141263; Rept-74-2002-10-Vol-4) Avail: NTIS HC \$5.75 CSCL 05C

The economic value of ERS information in the resource management area of extensive use of living resources, forestry, wildlife, and rangeland, is determined. Timber and forage resources are quantitatively evaluated. It is shown that these resources have economic value in the tens of billions of dollars, but the economic benefits of improved management of the forests and rangelands are not limited to efficiency in the production of these commercial resources. Multiple-use values including watershed, wildlife, and recreation are also involved. Author

**N75-14209\*** ECON, Inc., Princeton, N.J.  
**THE ECONOMIC VALUE OF REMOTE SENSING OF EARTH RESOURCES FROM SPACE: AN ERTS OVERVIEW AND THE VALUE OF CONTINUITY OF SERVICE. VOLUME 5: INLAND WATER RESOURCES**  
Elliot Wetzler, Wes Peterson, and Martin Putnam 31 Oct. 1974 413 p  
(Contract NASw-2580)  
(NASA-CR-141269; Rept-74-2002-10-Vol-5) Avail: NTIS HC \$10.50 CSCL 08H

The economic value of an ERTS system in the area of inland water resources management is investigated. Benefits are attributed to new capabilities for managing inland water resources in the field of power generation, agriculture, and urban water supply. These benefits are obtained in the area of equal capability (cost savings) and increased capability (equal budget), and are estimated by applying conservative assumptions to Federal budgeting information, Congressional appropriation hearings, and ERTS technical capabilities. Author

**N75-14210\*** ECON, Inc., Princeton, N.J.  
**THE ECONOMIC VALUE OF REMOTE SENSING OF EARTH RESOURCES FROM SPACE: AN ERTS OVERVIEW AND THE VALUE OF CONTINUITY OF SERVICE. VOLUME 6: LAND USE. PART 1: INTRODUCTION AND OVERVIEW**  
Keith R. Lietzke and Peter A. Stevenson 20 Dec. 1974 56 p  
(Contract NASw-2580)  
(NASA-CR-141266) Avail: NTIS HC \$4.25 CSCL 05C

The utility of an ERS system as an effective tool in land use management is analyzed. The potential new capabilities of a space based ERS system are qualitatively examined. A variety of resource management functions are postulated within which ERTS activities might occur and the present ERS investigations in these areas are outlined. Author

**N75-14211\*** ECON, Inc., Princeton, N.J.  
**THE ECONOMIC VALUE OF REMOTE SENSING OF EARTH RESOURCES FROM SPACE: AN ERTS OVERVIEW AND THE VALUE OF CONTINUITY OF SERVICE. VOLUME 6: LAND USE. PART 2: THE ROLE OF ERTS IN THE ESTABLISHMENT AND UPDATING OF A NATIONWIDE LAND COVER INFORMATION SYSTEM**  
Robert J. Christie 31 Oct. 1974 302 p

(Contract NASw-2558)  
(NASA-CR-141267) Avail: NTIS HC \$9.25 CSCL 05C

The utility of an ERS system as an effective tool in land use management is analyzed. The cost effectiveness of satellites as a component of an ERS system is presented based on various projected levels of demand. It is indicated that a cost savings potential of \$7.9 to \$37.1 million annually is attributable to the inclusion of ERS-like satellites in the ERTS system. Author

**N75-14212\*** ECON, Inc., Princeton, N.J.  
**THE ECONOMIC VALUE OF REMOTE SENSING OF EARTH RESOURCES FROM SPACE: AN ERTS OVERVIEW AND THE VALUE OF CONTINUITY OF SERVICE. VOLUME 7: NONREPLENISHABLE NATURAL RESOURCES: MINERALS, FOSSIL FUELS AND GEOTHERMAL ENERGY SOURCES**  
Keith R. Lietzke 31 Oct. 1974 85 p refs  
(Contract NASw-2580)  
(NASA-CR-141264; Rept-74-2002-10-Vol-7) Avail: NTIS HC \$4.75 CSCL 05C

The application of remotely-sensed information to the mineral, fossil fuel, and geothermal energy extraction industry is investigated. Public and private cost savings are documented in geologic mapping activities. Benefits and capabilities accruing to the ERS system are assessed. It is shown that remote sensing aids in resource extraction, as well as the monitoring of several dynamic phenomena, including disturbed lands, reclamation, erosion, glaciation, and volcanic and seismic activity. Author

**N75-14213\*** ECON, Inc., Princeton, N.J.  
**THE ECONOMIC VALUE OF REMOTE SENSING OF EARTH RESOURCES FROM SPACE: AN ERTS OVERVIEW AND THE VALUE OF CONTINUITY OF SERVICE. VOLUME 8: ATMOSPHERE**  
Richard Miles and Gregg Fawkes 31 Oct. 1974 96 p  
(Contract NASw-2580)  
(NASA-CR-141191; Rept-74-2002-10-Vol-8) Avail: NTIS HC \$4.75 CSCL 05C

The economic value of an ERS system in the resource area of atmosphere is determined. Benefits which arise from air pollution and cloud observations correlated to ground stations are discussed along with cost savings associated with air pollution monitoring by satellite. Social benefits due to more precise knowledge of the effects of pollution are presented. Author

**N75-14214\*** ECON, Inc., Princeton, N.J.  
**THE ECONOMIC VALUE OF REMOTE SENSING OF EARTH RESOURCES FROM SPACE: AN ERTS OVERVIEW AND THE VALUE OF CONTINUITY OF SERVICE. VOLUME 9: OCEANS**  
Keith R. Lietzke 20 Dec. 1974 134 p  
(Contract NASw-2580)  
(NASA-CR-141270; Rept-74-2002-10-Vol-9) Avail: NTIS HC \$5.75 CSCL 05C

The impact of remote sensing upon marine activities and oceanography is presented. The present capabilities of the current Earth Resources Technology Satellite (ERTS-1), as demonstrated by the principal investigators are discussed. Cost savings benefits are quantified in the area of nautical and hydrographic mapping and charting. Benefits are found in aiding coastal zone management and in the fields of weather (marine) prediction, fishery harvesting and management, and potential uses for ocean vegetation. Difficulties in quantification are explained, the primary factor being that remotely sensed information will be of greater benefit as input to forecasting models which have not yet been constructed. Author

**N75-14215\*** ECON, Inc., Princeton, N.J.  
**THE ECONOMIC VALUE OF REMOTE SENSING OF EARTH RESOURCES FROM SPACE: AN ERTS OVERVIEW AND THE VALUE OF CONTINUITY OF SERVICE. VOLUME 10: INDUSTRY**  
Keith R. Lietzke 31 Oct. 1974 36 p refs  
(Contract NASw-2580)  
(NASA-CR-141192; Rept-74-2002-10-Vol-10) Avail: NTIS HC \$3.75 CSCL 05C

The economic benefits of an ERS system in the area of industrial resources are discussed. Contributions of ERTS imagery to the improvement of shipping routes, detection of previously unknown and potentially active faults in construction areas, and monitoring industrial pollution are described. Due to lack of economic research concerning the subject of ERS applications in this resource area the benefit estimations reported are regarded as tentative and preliminary. Author

**N75-14216#** European Space Research Organization, Paris (France).

**EUROPEAN EARTH-RESOURCES SATELLITE EXPERIMENTS**

Bruce T. Battrick, ed. and Nguyen T. Duc, ed. May 1974 469 p refs Partly in ENGLISH and partly in FRENCH Proc. of a Symp. held at Frascati, Italy, 28 Jan. - 1 Feb. 1974 Original contains color illustrations (ESRO-SP-100) Avail: NTIS HC \$11.50

Proceedings of the symposium are presented. The main topic was the use of imagery data from ERTS-1. Data processing methods were discussed for ERTS, EREP, and Skylab imagery. Applications of these data were considered in the fields of oceanography, hydrology, and glaciology; geology and geomorphology; and agriculture, forestry, and vegetation.

**N75-14224** East Anglia Univ., Norwich (England).

**GENERALISATION OF ERTS DATA FOR GLOBAL-SCALE INVESTIGATIONS**

I. E. Hill, A. C. Armstrong, and K. M. Clayton In ESRO European Earth-Resources Satellite Expts. May 1974 p 75-80

A computer-based system is described for analysis of the imagery from the ERTS project. Information contained in ERTS imagery is of use on many spatial scales. To achieve a global scale, generalization to units of the order of 50 km by 50 km is necessary. This involves problems of both data retrieval and efficient and meaningful generalization. Some results of using a computer system based on analysis of the grey-scale histograms are presented and possibilities for future developments are discussed. Author (ESRO)

**N75-14246** Centre National de la Recherche Scientifique, Toulouse (France). Service de la Carte de la Vegetation.

**ARNICA/ERTS-1 EXPERIMENT. RESULTS AND PERSPECTIVES [EXPERIENCE ARNICA/ERTS-1. RESULTATS ET PERSPECTIVES]**

P. A. Rey In ESRO European Earth Resources Satellite Expts. May 1974 p 325-347 In FRENCH; ENGLISH summary Original contains color illustrations

The ARNICA program, concerned with processing of ERTS imagery covering southwest France and the Pyrenees, is discussed. Three fundamental fields have been treated: analog exploitation of the images, digital exploitation combined with automatic cartography, and ground truth experiments together with a study of atmospheric image transfer. ESRO

**N75-14259#** Army Foreign Science and Technology Center, Charlottesville, Va.

**SCIENTIFIC RESEARCH AND EXPERIMENTAL DESIGN PLANNING AND COORDINATION FOR 1973**

A. E. Sitalov 15 Apr. 1974 7 p Transl. into ENGLISH from Geodez. i Kartograf. (Moscow), no. 2, Feb. 1973 p 72-74 (AD-785998; FSTC-HT-23-0158-74) Avail: NTIS CSCL 08B

The report gives the results of a meeting discussing coordination of plans and projects in geodesy, aerial photography and cartography. New techniques, instruments and cooperation are introduced for 1973 to increase the efficiency of work done by the geodetic service. The topographical, geodetic and cartographic services are now part of the Scientific and Technical Mining Society. GRAI

**N75-14358#** National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Tex.

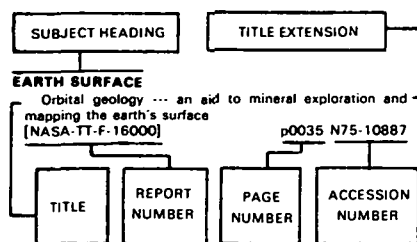
**THE PROCEEDINGS OF THE SKYLAB LIFE SCIENCES SYMPOSIUM, VOLUME 1**

Richard S. Johnston and Lawrence F. Dietlein Nov. 1974 430 p refs Presented at Houston, Tex., 27-29 Aug. 1974 2 Vol.

(NASA-TM-X-58154-Vol-1; JSC-09275-Vol-1) Avail: NTIS HC \$11.25 CSCL 06B

The three manned Skylab missions resulted in biomedical experiment data in the areas of neurophysiology, musculoskeletal physiology, biochemistry, hematology, cytology, cardiovascular and respiratory metabolic functions; as well as detailed test objectives involving crew health and environment procedures. Major emphasis was placed on results from the last mission, Skylab 4, which covered 84 days of in-flight data collection. Many new norms were defined for normal man living and operating in a unique environment. While man is quite adaptable to this unique environment, many of the changes observed in Skylab require additional research for future flights lasting very long periods of time such as a Mars mission requiring 18 months.

## Typical Subject Index Listing



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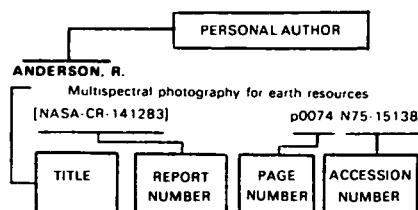


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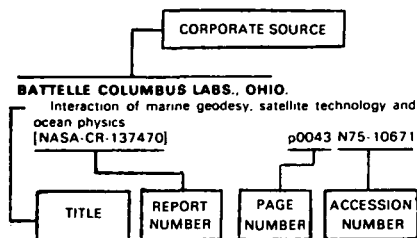
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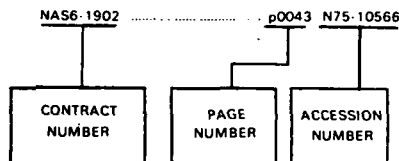
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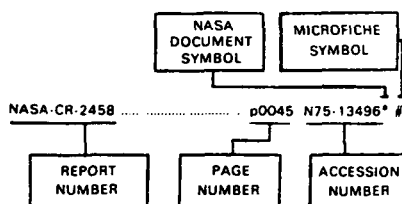
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